FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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CONTENTS

DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Oct. 31 ... Air Meeting at Villacoublay

Nov. 1 ... First Open Competition for R.A.F. Boy Mechanics

Nov. 4 ... Lecture, "The Human Machine in Relation to Flying," by Wing-Commander Flack, at the Royal Society of Arts

Nov. 5–13 .. S.M.M.T. Motor Car Exhibition at Olympia and White City

Nov. 16 ... Entrance Examination for R.A.F. Cadets

Nov. 17 ... Annual Dinner of Royal Aeronautical Society, Connaught Rooms. Right Hon. Lord Weir of Eastwood in the Chair

Nov. 18 ... Lecture, "The Problem of the Helicopter," by M. Louis Damblanc, before R.Ae.S., at the Royal Society of Arts, at 5 p.m.

Dec. 2 ... Lecture, "Airship Piloting," by Major G. H. Scott, C.B.E., A.F.C., before R.Ae.S., at Royal Society of Arts

EDITORIAL COMMENT

THE announcement made by the Royal Aeronautical Society, that in future all papers and communications destined for places abroad to which there is aerial communication will be sent by air mail, is a practical move in the right direction. We are exceedingly glad to know of the decision, and trust that it will be very generally followed by all bodies and individuals associated with or interested in the development of commercial flying. A little example like this is worth a great deal of abstract doctrine, and must produce an excellent effect in public circles, if only because it indicates that a body like the Society, which really knows the exact measure of reliability attaching to aviation, is content to trust valuable documents and communications to the air mail. It is all very well to advise the business community to take advantage of the facilities afforded by the most rapid modern form of transport, but it is easy to see that the question might arise of why the aeronautical bodies, which are insistent in their advocacy of the use of aircraft for transport purposes, have not set an example. As a matter of fact, they have done so, but they have not said so in public announcements. This has now been done, and we look to the example being widely followed.

Practical Encouragement of Air Mails

The first to do it should be the Air Ministry itself. It is the official department responsible for fostering civil flying. It must, in the ordinary course, have much correspondence with places abroad, and while we doubt not that very much of this correspondence is actually carried by aircraft, the fact has not hitherto been disclosed. We suggest that it would be productive of an extraordinary amount of good if an Air Ministry order were issued and made public to the effect that official correspondence is always to be forwarded by air where aerial services are working and where it is at all possible. That would do more to enhance the public confidence in the safety of aerial transport than any amount of newspaper propaganda. Then, such bodies as the Royal Aero Club and the Royal Air Force Club should also make it a rule to forward all possible correspondence

by air mail, and to let it be known that this is a standing instruction. Above and beyond that we conceive it to be the bounden duty of everybody interested to use the air mail wherever it is possible. The development of civil aviation, which depends initially on the growth of the mail services, hangs on the steady support of the public. The latter is quick to follow example, and there is no doubt that a widespread movement such as we suggest would form such an example. If everybody would do as we have indicated, then the figures relating to the bulk of the air mails carried over a period would show such a steady increase that the public would begin to really believe that there is something in aerial transport and would follow the lead. To the individual this may seem a small matter. He may think that the one or two letters per week, or even per month, he can send by the established mail services are of no account. The movement we suggest, however, is really a sort of snowball, one in which every single one interested can help. We therefore appeal, in the name of the success of civil flying, to all in any way associated with the movement to help it along by doing as we advocate. Get in a stock of those little blue Post Office " By Air Mail " labels, and wherever opportunity offers attach them to your correspondence. It is eminently a case where every little helps.

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Aircraft in Naval Warfare

On Trafalgar Day, Major.-Gen. Sir George Aston delivered an exceedingly interesting lecture at University College on " Jutland." In the course of his address he said that the most important of all the many lessons learned from the battle was the need of better communications for intelligence and orders with the huge forces and bad conditions of visibility in the North Sea.

It is a very delicate matter for the layman to enter upon criticism of the preparations made by professional strategists and tacticians to meet a set of conditions such as obtained at Jutland—conditions which must have been foreseen, inasmuch as those responsible for our naval defences were perfectly familiar with the North Sea and its meteorological vagaries and with the character which would be assumed by a great action between armoured fleets. But to the outside observer it must occur that our own authorities attached too little importance to the use of aircraft, and in particular to that of the large airship, for observation and intelligence work with the fleet. The Germans, on the other hand, seem to have had a much better appreciation of their value. The history of the German raids on the East Coast shows that these were successfully carried out and the escape of the enemy ships assured through the use of the naval Zeppelins, which were employed to report the movements of the British battle-cruiser squadrons and to inform the naval command when conditions were favourable. The result was that the Germans were able to attack at the most favourable moment, and with the single exception of the raid which ended in the action of the Dogger Bank their ships were able to successfully elude our own pursuing forces. Even that exception has its own story. The German aerial reconnaissance was not at fault so much as that it was deceived by the sighting from a scouting airship of what was believed to be the British battle-cruiser squadron in a position from which it was impossible for it to have reached the threatened point or to have intercepted the enemy on his way back to his base. What the Zeppelin saw, however, was a squadron of the famous " dummy " ships.

There can be no doubt that the German aerial scouting was very much superior to our own right up to the date of the battle of Jutland. We had no large airships at the outbreak of War, nor had we any until long after the battle. Whether the possession of three or four big rigids would have enabled Lord Jellicoe to destroy the German fleet is quite uncertain and need not now be discussed. What is certain, however, is that in the conditions which obtained on the day of the battle their presence would undoubtedly have assisted in clearing up a tactical situation which was obscure right up to end of the day.

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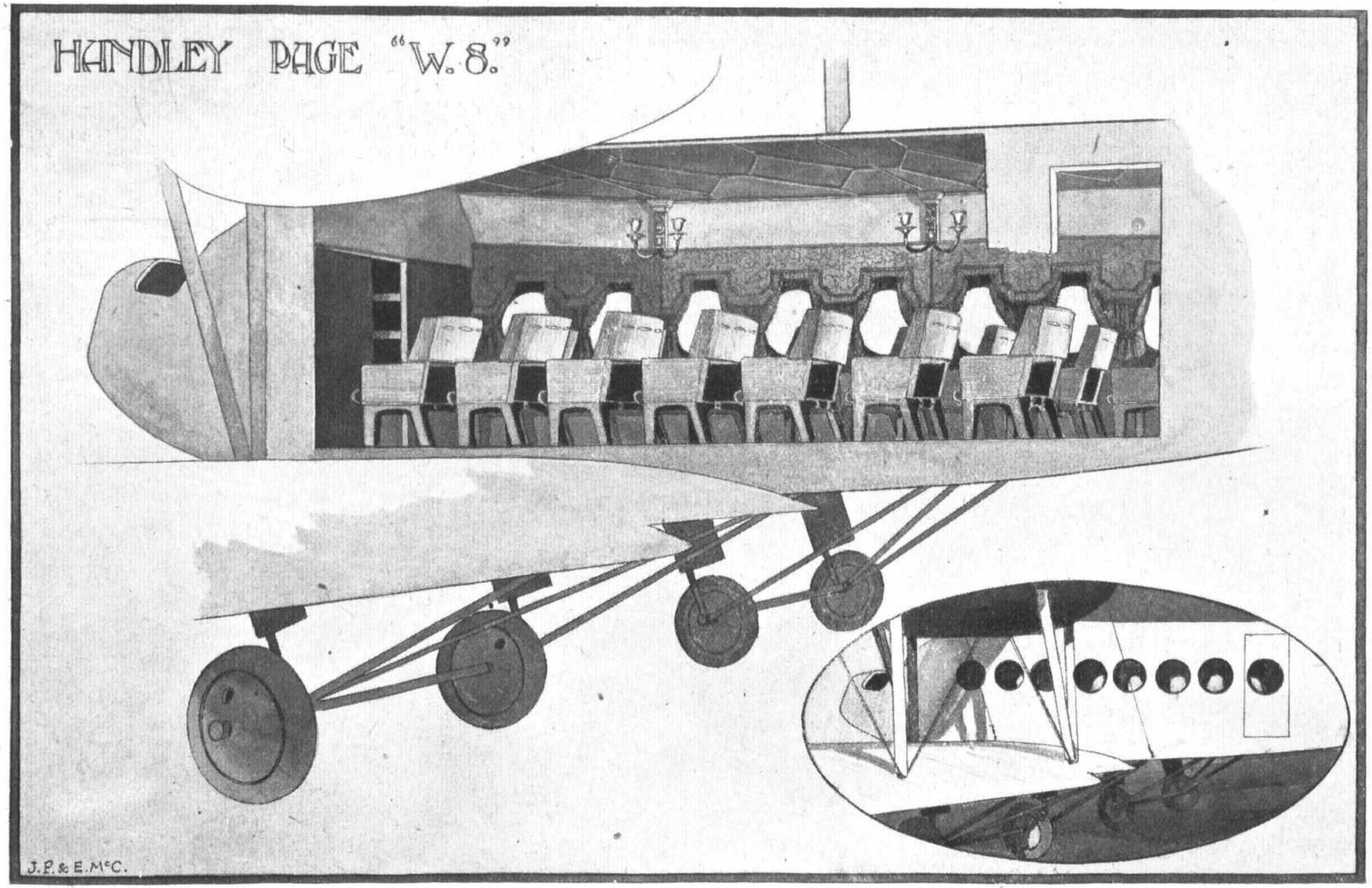
" Intelligence and Orders "

Sir George Aston, as we have noted, made the point that better communications for orders and intelligence were needed. Obviously, orders must always depend upon the nature of the intelligence available, and it is of no avail whatever to possess even perfect means of communication if the essential intelligence is lacking. We should prefer to divide the question rather more minutely, and to say what was lacking at Jutland was the means of securing accurate intelligence in the first place, and, in the second, quite possibly the best means of communicating it if it were obtained. There can be no doubt at all that the conduct of the battle was hampered tremendously by the fact that the commander-in-chief was faced by an obscure situation which the methods of reconnaissance by surface craft were not adequate to clear up in the conditions of visibility on the day. On the other side, it is reasonably clear that in spite of the fact that the conditions were far from favourable for aerial observation, the German airships did succeed in keeping von Scheer fairly accurately informed of the proximity and movements of the Grand Fleet. The deduction to be drawn from the facts seems to be that aircraft are an absolutely indispensable auxiliary of fleets before and during a great action, and that it was in our failure to provide them in sufficient number and of the right type that the real handicap to " intelligence and orders " consisted.

Sir George further discussed the effect of aircraft on future naval warfare, and predicted that the difficulty of getting at fleets sheltering in defended harbours would one day be solved by the extended use of aircraft, which might thus acquire a dominating influence over the sea war. When this comes to pass it will be true that sea-power has ceased to be the goal of an insular nation like our own, and that we must strive to maintain an overwhelming air-power. But many things will happen before aircraft have attained the upper hand over sea-power. If there is one lesson which is to be learned from a study of war it is that as new methods of attack or defence are evolved, so are new methods of countering almost immediately devised. It may be that as air-power develops so will there develop a tendency to build navies which can disappear beneath the sea, and the day of the submersible battleship will have arrived. Or it may be that the defence against aircraft will be more powerful than the attack. It may, on the other hand, be that nations will vote the condition of stalemate to their surface fleets indicated



Interiors of Commercial Machines: I. The Handley Page W.8.

by Sir George so intolerable that sea-power will disappear as a decisive factor and that air-power will take its place. We cannot tell, but to speculate is of much more than passing interest.

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Paying for the Air Convention

Quite a small debate took place in the House the other day when the Air Secretary moved a resolution to authorise the payment of money to enable effect to be given to the convention for regulating air navigation, and to make further provision for its control and regulation. He explained that a Bill for the purpose had passed the House and been referred to a Committee, and that the resolution was required in order to enable the Committee to deal with the financial clauses of the measure.

The resolution was approved after discussion. There was really nothing in this discussion, which simply took the shape of an enquiry for information as to the intentions of the Air Ministry regarding the development of aviation, and it would not have been worth while referring to it at all were it not that it showed how much interest is now being taken by a large section of the House in matters affecting flight and its future. There is no doubt that intelligent interest in and appreciation of the possibilities of aerial navigation is increasing rapidly, and that the House of Commons generally should manifest an enquiring attitude when aviation is the subject to be discussed is all to the good. Another pleasing feature is that it is not alone among those who are closely identified with the movement that this interest is being shown. It comes also from parts of the House from whence it might least be expected, and seems to indicate that we are indeed getting on.

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MODERN CABIN MACHINES

THERE is a marked tendency in the design of modern passenger-carrying aeroplanes to provide cabin accommodation for the passengers so as to protect them against the rush of air and to relieve them as much as possible of the noise of the engines. Many modern machines are designed to give, from this point of view, as great comfort as that enjoyed by railway travellers, the upholstery and decorations being in many cases equal to or even superior to that of the older mode of locomotion. As regards the actual arrangement of the passenger cabin, this differs a good deal according to the type of machine, and nothing like finality has yet been reached. Thus, in the matter of single-engined machines there are two general schemes in use. In one of these the pilot is placed ahead of the cabin, in the other he is seated aft of the cabin. Which form will ultimately survive is not possible to predict, both arrangements having their peculiar advantages. In twin-engined machines, on the other hand, it appears that the standard arrangement is to have the large cabin more or less between the wings, and to place the pilot and engineer in an open cockpit in the nose of the body.

In order to show some typical arrangements of cabins we have had prepared a series of drawings showing the interiors of a number of modern machines, from which a very good idea may be formed both of the seating arrangements and of the general scheme of decorations, etc. We commence publication of these views this week with a picture of the cabin of the Handley Page W8, winner of the first prize in the large class in the recent Air Ministry Competition.

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Honour for Wing-Commander Prince Albert

THE KING has approved of the appointment of Wing-Commander his Royal Highness Albert F. A. G., Duke of York, Earl of Inverness, K.G., Royal Air Force, hon. Colonel 4th Battalion the Queen's Own Cameron Highlanders (T.F.), to be Colonel-in-Chief of the 11th (Prince Albert's Own) Hussars.

Indian Help to R.A.F. Memorial

THE Secretary of the Royal Air Force Memorial Fund reports that by the last Indian Mail a draft for £55 has been received as a contribution to the Fund. This sum is the result of an effort made by His Honour, the Lieut.-Governor of the Punjab, and the subscriptions range from 100 rupees down to 15 rupees. It is particularly pleasing to note that the subscriptions are from distinguished residents of the Punjab, including not a few natives of India who hold Government positions.

The Secretary has also received an announcement that His Highness the Maharajah of Dohlpur is remitting a draft for 300 rupees (roughly £30).

Air Force Examinations

THE Air Ministry announces that the Air Council have approved of a revised syllabus of subjects for the Royal Air Force entrance examination, to come into force at the examination to be held in June, 1921. The syllabus will be substituted for that shown in Appendix II of the Provisional Regulations respecting admission to the Royal Air Force (Cadet) College, after the November, 1920, entrance examination.

A "Redcarite" Reunion

IT has been suggested that all ex-officers and men who served at Redcar Air Station, who intend visiting the motor show should do so on either November 10 or 11 and that they should meet in the gallery near the bandstand, between 6.30 and 7 o'clock. It is proposed to hold the second annual dinner on November 13, and those who can attend are asked to write to Mr. Walter E. Crozier, c/o Bank of Adelaide, 11, Leadenhall Street, E.C. 3.

The Problem of the Helicopter

MONS. LOUIS DAMBLANC, who has recently been carrying out some experiments with a full size direct-lift machine under the direct auspices of the French Government, is to read a paper on this subject before the members of the Royal Aeronautical Society at 5 p.m. on November 18, at the Royal Society of Arts Adelphi. In view of the importance attached to the development of a practicable machine of this nature, M. Damblanc's paper is certain to arouse considerable discussion among experts.

An Air Port for Quebec

THE interest aroused by the recent trans-Canadian flight appears to be bearing good fruit as it is announced that the Canadian Air Board is considering a scheme for the establishment of an air port for trans-Continental seaplanes at Lampson's Cove on the river front. The Quebec Harbour Commission has been asked to take over a licence from the Board.

Air Mails for American Embassy

A PRACTICAL move by the American Military Attaché here is the decision to send all personal and other mails from his office at the American Embassy in London to any point on the Continent are now dispatched by air, with the sole exception of such communications as it is necessary to forward by the Embassy Courier.

A Portuguese Airship in the Sea

SOME mystery attaches to the reported disappearance of a Portuguese airship which is said to have started from Lisbon Aviation Camp on October 19 for Madeira. It is supposed that the airship lost its bearings in a fog and fell into the sea about 200 miles E.N.E. of Madeira. One report says that two Portuguese military aviators have been picked up by an American or British ship which called at Gandia river.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

THE HANDLEY PAGE WING

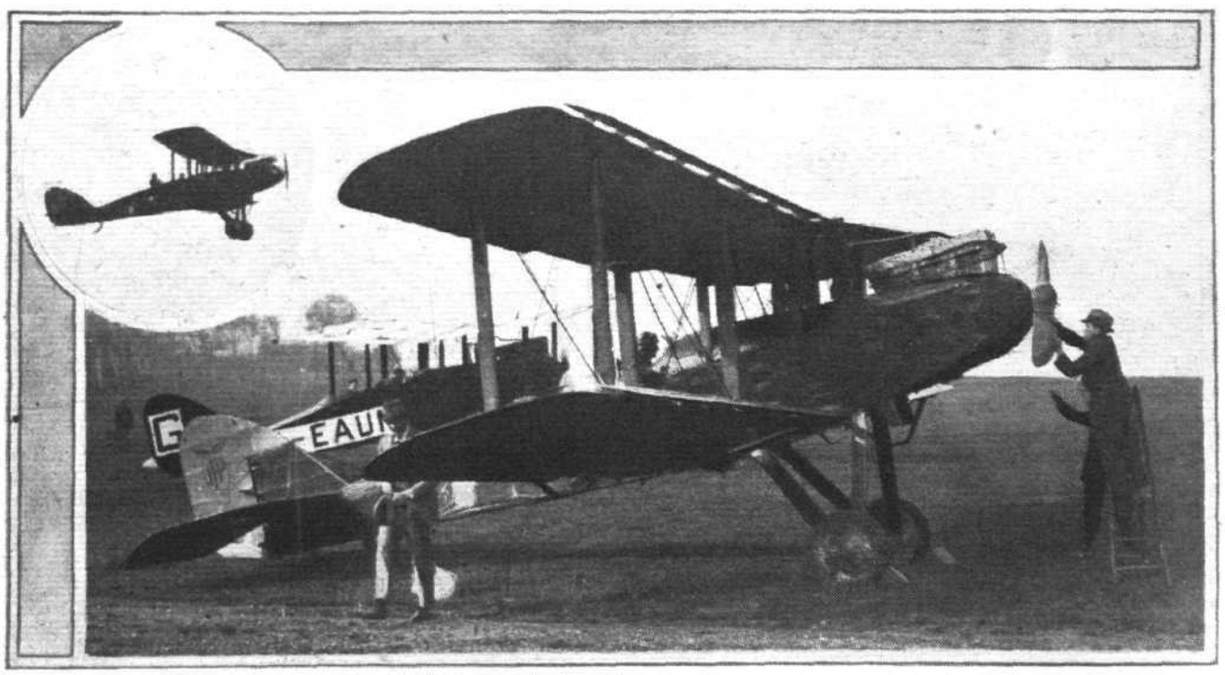
First Public Demonstration

IT is now about a year since Mr. Handley Page first told us of his discovery in the matter of high-lift wings, but owing to the slowness with which the mills of Patent Offices are wont to grind, it has not hitherto been permissible to publish any information relating to the new wing. The patents have now, however, been published, and this was made the occasion for a public demonstration at the H.P. aerodrome at Cricklewood on October 21. It should be pointed out, however, that the machine with which the demonstration was made did not represent the latest progress in the design of the new wing. On the contrary, the machine used was the same on which the first full-scale experiments were carried out many months ago, and represents the idea in its crudest form only. It appears desirable to make this statement, since otherwise an erroneous impression might be created, which would tend to depreciate the merits of the new discovery.

The demonstration which took place at Cricklewood was given by Major Foote, who had, by the way, never previously flown the machine. Starting simultaneously was another Airco 9, which obviously required a much longer run before getting off. The Airco 9 fitted with the H.P. leading edge got off after a surprisingly short run. What particularly impressed one in the climb was the angle at which the machine rose. In point of fact its climb was probably a little slower than that of the standard machine, but its climbing *angle* was certainly steeper. This points to the advisability of adopting the suggestion made by Mr. R. F. Mann in our correspondence columns recently that the climb of a machine should be measured by the angle, as well as by the time taken to reach a given height. In this case the standard machine took less time to reach a certain height than did the one fitted with the H.P. leading edge, but the *angle* of climb of the latter machine was undoubtedly the greater. For a commercial machine at any rate it is the *angle* of climb that counts, rather than the *rate* of climb, and the Airco 9 with the H.P. attachment would certainly get out of a smaller field than would the standard machine.

The behaviour of the "faked" machine in the air was much the same as that of the standard machine, excepting that the horizontal speed was obviously not improved by the attachment. It should be remembered, however, that the false leading edge was rigidly attached in this machine, thus offering much greater resistance than will the more modern development in which the leading edge can be moved back so as to lie flush with the main leading edge. In that case the wing resistance is hardly affected at all, while with the leading edge in the "out" position the lift is very much increased. It was noticed that when the machine was flying horizontal and the pilot throttled down the engine, the machine

THE HANDLEY PAGE WING: Capt. G. de Havilland and Mr. Handley Page in front of the de H.9 to which the H.P. device is fitted



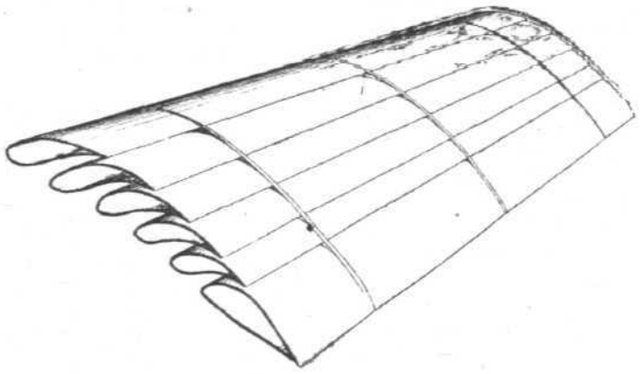
THE HANDLEY PAGE WING: The Airco 9 fitted with the H.P. device. Inset the machine in flight. The false leading edge and its supporting brackets can be clearly seen

immediately started pancaking instead of getting its nose down. While doing this the horizontal speed was very low, and when the nose was pulled up the machine appeared to be hanging in the air, dropping slightly all the time. Also in coming into the aerodrome to land the machine seemed to pancake a lot, all due to the extra resistance of the attachment, but when the tail was brought down she settled gently and came to rest after a run of a few yards only. The second time Major Foote took her up he left the ground with wheels and tail skid at the same time, never bothering about getting the tail up for the preliminary run. This time the climbing angle appeared to be even better than on the first occasion, possibly because the pilot was beginning to get used to the machine.

As a practical demonstration of what is already accomplished, although in its crudest form, the exhibition was of great interest, and it requires but little imagination to foresee the effect which the new discovery will have on the future of aeroplane design. As flown on Thursday of last week, the machine had neither the adjustable leading edge nor the best leading edge shape, nor the best gap or slot width. When such good results can nevertheless be obtained, it will be seen that with more refinement much more will be achieved.

The Wing

Turning now from the practical demonstration to the details of the new Handley Page discovery, this consists of a false leading edge secured a short distance in front of the leading edge proper of the wing. The section of this false leading edge is not unlike the Schukowsky aerofoil, *i.e.*, the nose of the section is fairly thick, and maximum camber of the lower surface occurs rather far toward the trailing edge. The false leading edge is placed at a negative angle to the chord line of the main section, and the gap which separates it from the main leading edge is greater underneath than it is on top. This represents the discovery in its simplest form, and before discussing developments of this a few words regarding the possible explanation of the high lift obtained may not be out of place.

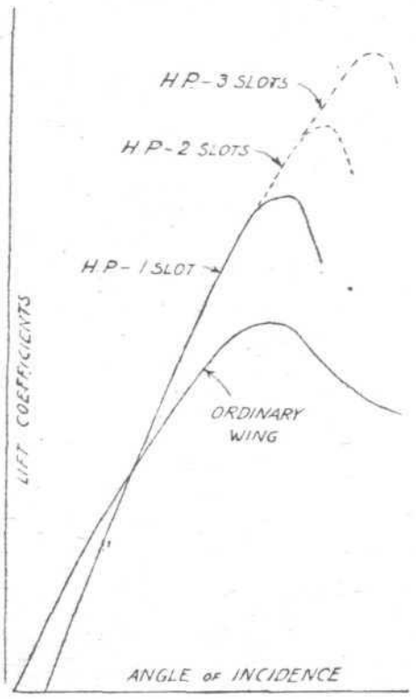


THE HANDLEY PAGE WING: Diagrammatic sketch showing a "plurality" of slots

The Handley Page Wing: Diagram showing single and double slot arrangement

Aerodynamical Features

It has already been mentioned that the slot separating the false from the main leading edge is contracted towards the upper surface. It appears that the effect of this is to give a form of Venturi tube effect. The air tries to rush through the opening in the plane, and on the face of it one would be inclined to think that the result would be a loss of lift. Here is probably where the Venturi effect comes into action. At small angles of incidence there is, as a matter of fact, a loss of lift, as shown by wind tunnel experiments, but at large angles there is a very marked increase in lift. Probably the explanation is that the positive pressure under the nose of the section is not all lost through the slot, while the quantity of air which gets through does so at a greatly-increased velocity, owing to the narrowing of the slot towards the top. The result of this increased velocity is that the air is swept upward with great force, thus augmenting the phenomenon which takes place in front of the leading edge of the ordinary wing. If this should prove the correct explanation, it is logical to conclude that the addition of another strip and its slot would add to the lift. Wind-tunnel tests show this to be the case, in fact it appears that for each slot added the lift increases. Recent tests have shown that it is possible to obtain absolute lift coefficients of close upon 2.0, or four times as great as those obtained with the majority of modern high-speed sections. Whether this represents the limit there is at present no way of ascertaining, but it should be remembered that much research work yet remains to be done on the shape of the sections and the shape of the slots separating them before the best combinations can be found. Also it should be realised that the Handley Page wing is at present in much the same stage of development as was the ordinary aerofoil about ten years ago. When looking at modern wing sections these do not appear to differ markedly from those used round about 1910 or 1911; yet the difference in efficiency is very great indeed. When the Handley Page wing has been as thoroughly tested out and refined, there is absolutely no telling what results will be obtained. As the work involved is very considerable, this will naturally take time, and the problems are not only aerodynamic but also mechanical. There does not, however, appear to be any doubts that at the stage already reached it will be possible, both aerodynamically and mechanically, to construct wings giving twice as high a maximum lift as that of present-day wings. Already with a single slot it has been found that it is possible to increase the lift coefficient from .5 to .8. With two slots, once the best combination of section and slot has been discovered, there is every reason to expect that the lift of a wing may be doubled. This will, of course, mean that for the same landing speed the wing area need only be half that of the ordinary wings, the loading per square foot of area being doubled. What this will mean in the case of adding the Handley Page system to a high-lift wing is a



The Handley Page Wing: Graph showing qualitatively the difference in the lift curves of the ordinary wing and a Handley Page wing with 1, 2 or 3 slots. The graph is not to scale, and is intended to indicate the general character only of the lift curves

matter for surmise, since the percentage alteration may, and probably will, differ for different wing sections, but it seems reasonable to suppose that maximum lift coefficients of 1.2 are at any rate within sight. In the case of the very first model tested (at the N.P.L.) the R.A.F. 6 was used, with a single slot attachment. The maximum lift coefficient was very markedly increased, while at small angles it was found that the lift coefficient was considerably decreased. The effect on the L/D ratio is of interest. In the model tested, the false leading edge was so pivoted that it could be placed with the slot open or closed. With the slot closed the L/D was reduced from 19 to 16.6, and with the slot open the L/D became 14. Thus with the false leading edge permanently fixed there is a considerable increase in resistance. As this represents the case of the Airco 9 flown the other day, it throws some interesting light on the demonstration, and explains why the machine commenced to pancake immediately on throttling down the engine. These figures, as has already been said, represents the very first step in the development of the H.P. wing and since then very much better results have been obtained. It appears that for each slot added there is a marked increase in the maximum lift coefficient. The percentage increase thus obtained varies according to slot width, slot shape, and shape of the leading edge section, but the accompanying graph gives a rough indication of the nature of the increase, and also indicates how the lift curves differ from that of standard sections. This graph is not to scale, and only represents in a general way the results obtained by the slotted wing. From a stability point of view it is of interest to note that in the N.P.L. tests already referred to it was found that the c.p. was practically stationary over fairly wide ranges of incidence.

The Practical Application

From what has been said it will be understood that there are some very great possibilities from an aerodynamical point of view in developing the H.P. wing. Mechanically there are as yet a number of problems to be solved. In its simplest form, however, with one false leading edge and one slot, it would appear that it should be no very difficult matter to provide mechanical means of opening and closing the slot for slow and fast flight respectively. A number of methods suggest themselves readily. For instance, the simplest form would probably be to pivot the false leading edge around a steel tube, and close the slot by turning the false leading edge until its rear edge rested against the main leading edge. This would probably not be the best form aerodynamically, since the opening on the lower surface would still tend to increase the resistance. A more efficient way would be to move the false leading edge bodily in a fore-and-aft direction, so as to close completely the slot by having the lower surface of the false leading edge in contact with the nose of the main wing. Two methods of doing this seem fairly obvious. One consists in having the brackets carrying the false leading edge extended aft inside the main wing in the form of racks, and to have lateral shafts inside the wing, carrying pinions engaging with these racks. A second way might be to carry the false leading edge on brackets hinged on vertical hinges, so that by moving the false leading edges outwards or inwards the slot would be simultaneously opened or closed.

It has already been mentioned that the fore and aft stability of the H.P. wing appears to be excellent. As regards lateral stability, however, it may be expected that the problem is more difficult. When we come to maximum lift coefficients of 2.0, it appears probable that these will occur at very large angles of incidence, and the question of controllability laterally will then probably prove troublesome. However, wind-tunnel tests will go a long way toward solving these problems. There can be no doubt that Mr. Handley Page has made a discovery which is likely to have the most far-reaching effects upon future design, and as we have already said, it is not at present possible to surmise how far we shall get along these lines. What is immediately possible is, however, in itself sufficient to warrant the application of the principle to commercial machines, and we rather imagine that one of the first practical applications of the wing should be to a cantilever wing. In the first place, such a wing already has a high lift, and is therefore likely to show a very high K_1 max. when fitted with the attachment. The fact that its L/D may be somewhat inferior to that of high-speed wings will not matter so much in view of the fact that its area can be very much smaller. Secondly, the thick cantilever wing has ample room inside it for housing the operating gear of the movable leading edge. Also there appears to be a tendency at present toward the adoption of the cantilever wing for commercial purposes, which rather tends to indicate this type of wing as one of the first steps in the development of the truly commercial aeroplane. In any case, it appears to us that Mr. Handley Page is in the enviable position of being able to watch quietly while somebody produces a really splendid high-lift wing. He can then come forward and say "Double you."

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN OCTOBER 17 AND OCTOBER 23, INCLUSIVE

Route	No. of flights*	No. of passengers	No. of flights carrying: Mails	No. of flights carrying: Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and No. (in brackets) of Machines Flying
						h. m.		
Croydon-Paris	25	57	10	17	20	2 35	Airco 16 G-EAQS (2h. 0m.)	A.9 (2), A.16 (3), A.18 (2), B. (4), G. (2), N. (1), W. (2).
Paris-Croydon	23	44	5	13	20	2 23	Airco 16 G-EAQS (1h. 50m.)	A.9 (2), A.16 (2), A.18 (2), B. (5), G. (1), N. (2), W. (2).
Cricklewood-Paris ...	5	24	—	4	5	3 23	Airco 9 G-EAUC (2h. 45m.)	A.9 (1), H.P. (4).
Paris-Cricklewood ...	5	25	—	3	5	2 58	H.P. G-EATH (2h. 10m.) ...	A.9 (1), H.P. (4).
Croydon-Amsterdam ...	7	3	—	6	7	2 26	Airco 16 G-EAPT (1h. 53m.)	A.9 (4), A.16 (2).
Amsterdam-Croydon ...	8	3	5	5	7	3 15	Airco 18 G-EAUF (2h. 45m.)	A.9 (4), A.16 (2), A.18 (1).
Cricklewood-Amsterdam	4	—	4	4	3	?	?	A.4 (1), A.9 (1).
Amsterdam-Cricklewood	4	—	1	1	4	?	?	A.4 (1), A.9 (1).
Croydon-Brussels ...	1	1	—	—	1	—	Cricklewood Service ...	A.9 (1).
Brussels-Croydon ...	2	2	1	1	2	—	" "	A.9 (1), Br. (1).
Cricklewood-Brussels ...	8	15	6	6	6	3 12	Airco 4 O-BATO (2h. 25m.)	A.4 (2), A.9 (4), H.P. (1).
Brussels-Cricklewood ...	6	5	3	2	5	2 26	Airco 9 G-EAUN (1h. 55m.)	A.4 (4), A.9 (2).
Totals for week ...	98	179	35	65	85			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.

A.4 = Airco 4. A.9 = Airco 9 (etc.). Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. N. = Nieuport. P. = Potez. Sa. = Salmson. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc. :—Air Post of Banks; Air Transport and Travel; Co. des Grandes Expresses Aériennes; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

THE BRISTOL TOURER SEAPLANE

VERY satisfactory trials have just been carried out with a tractor seaplane constructed by the Bristol Aeroplane Co., Ltd., which will be known as the "Bristol Tourer Seaplane."

In most respects this machine has the same characteristics as the well-known Bristol two- and three-seater Tourer types, brief descriptions of which have already appeared in FLIGHT. The only alteration of importance is, of course, the substitution of floats for wheels. These floats, of which there are two, are comparatively long, being 19 ft. 6 ins. overall length, and extending far back as they do, a tail float is rendered unnecessary.

They are very soundly constructed, being exceptionally strong for their weight, which is only some 200 lbs. for each float. Along the whole length of the top deck of each float is a walking way, which allows one to move along the floats without the fear of damaging them—an advantage of no small import in seaplane work. Attachments for towing lines are also mounted on the deck of each float.

Each float is divided into six water-tight compartments, and has a stepped "V" bottom. The *fuselage* is supported on the floats by two pairs of struts, the standard V-chassis of the land type gear being unsuitable. The floats are so mounted that they are readily detachable, so that for stowing, transport or overhaul purposes they can be removed and the machine rested on its chassis. The removal or replacement of the floats may be effected without any interference with the bracing wires.

In order to facilitate steering when taxi-ing on the water, water rudders, connected up with the control, are mounted on the stern of each float.

For the purpose of the first trials a standard 3-seater "Bristol" Tourer was used. In addition to the pilot and two heavy passengers some 40 lbs. of ballast were carried. With this load and in calm weather the machine took off from the water within a length of 400 yards, and in the air behaved very creditably, well maintaining the reputation of the "Bristol" Tourer types as flying propositions.

THE NEW BRISTOL TOURER SEAPLANE: A side view of the machine, and, inset, taxi-ing on the water

THE NEW BRISTOL TOURER SEAPLANE: A three-quarter front view

British Officers for Chilean School

MAJOR F. P. SCOTT, of the Royal Air Force, and three other instructors engaged by the Chilean Government for the School of Aviation at Santiago, were reported to have arrived at Valparaiso last week.

By Air to Riga

AN air service between Königsberg and the neighbouring Baltic States is being organised by the Deutsche Luft-Reederei; the first test flight between Königsberg and Riga took place on October 19.

FLIGHT

AIR MINISTRY NOTICES

(No. 104).—France : Customs Stations on the Swiss Frontier

(1) French Customs aerodromes and seaplane stations on the Swiss frontier have been appointed as follows :—

Aeroplanes.—(*a*) Machines proceeding from Geneva or Lausanne to Lyons will land at *Amberieu* for customs purposes and must pass over the Bellegarde zone (*i.e.*, within 3 kms. of Bellegarde.)

(*b*) Machines proceeding from Lausanne to Paris will land at *Dijon* for customs purposes pending the completion of a customs aerodrome at Pontarlier, and emergency grounds at Arc, Senans and Levier, the zone for crossing the frontier being between Les Verrières and Mouthe.

(*c*) Machines proceeding to Alsace-Lorraine will land at *Mulhouse* for customs purposes, crossing the frontier between Delle and Ferrette.

Seaplanes.—(*a*) Seaplanes coming from Switzerland to the free zone of Upper Savoy must alight at *Thonon* or *Evian* for the examination of passports. It is to be understood that neither assistance, accommodation, nor supplies can be obtained at *Evian* from the S.N.Ae.

(*b*) Seaplanes coming from Switzerland to the interior of France must cross the frontier at Bellegarde and alight at *Annecy* for customs purposes.

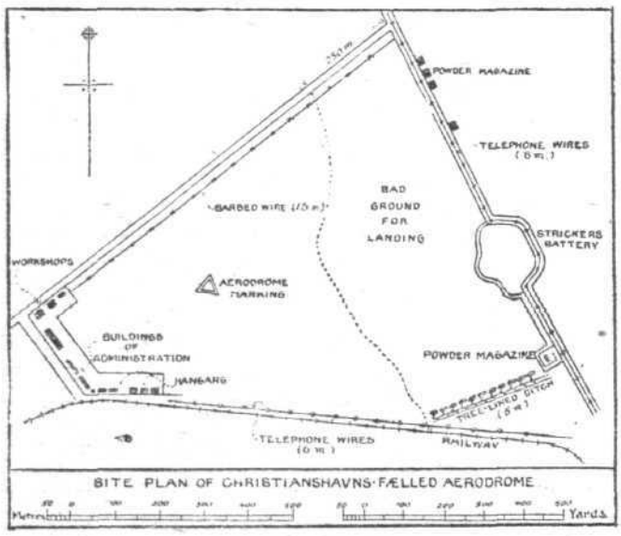
(2) These regulations apply to British machines which land in France when flying between Switzerland and Great Britain, but not to those making a through flight.

Authority : French " Bulletin de la Navigation Aérienne " No. 5.

(No. 105) Denmark : Customs Aerodrome and Seaplane Station at Copenhagen

(1) *Customs Aerodrome.*—Christianhavns Field, Copenhagen, is situated at the S.E. border of the town, to the S. of the seaplane station, and is bounded on the N.W. by a road, on the N.E. by the coast and on the S. by a railway line. The aerodrome is officially controlled and is the *only* Customs station for aeroplanes arriving in or departing from Denmark.

Along the N.W. boundary, which is about 1,000 metres in length, there is a barbed wire fence 1·5 metres high ; along the coastal boundary, which is about 1,000 metres in length, there are telephone wires about 8 metres high ; and along the railway there are telephone wires 6 metres high. In the S.W. corner there are repair shops, offices and hangars. The easterly part of the aerodrome is bad for landing and

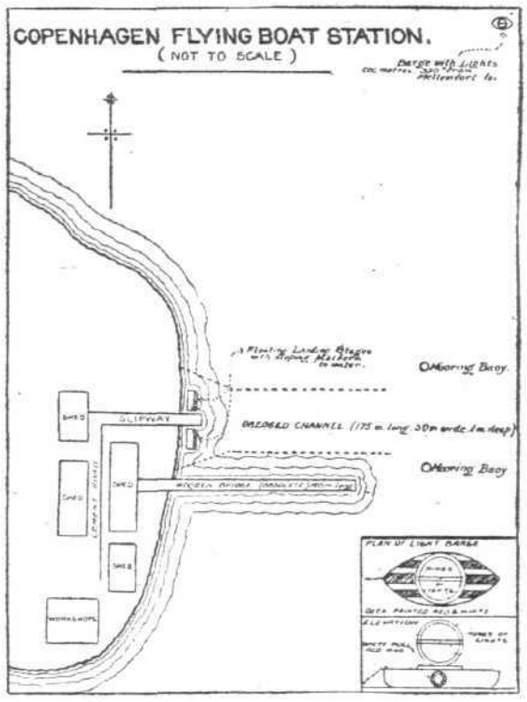


in the S.E. corner there runs a stream of water and a tall hedge. On the W. side, there is a landing mark, an equilateral triangle, marked in white, the apex being to the north.

(2) *Customs Seaplane Station.*—The Naval seaplane station Copenhagen, is situated at the N. end of Amager, to the W. of Mellemfort Island, 55° 41′ 03″ N., 12° 37′ 10″ E. By direction of the Ministry of Marine it is now open to civil aerial traffic, and is the *only* Customs station for hydro-aeroplanes arriving in or departing from Denmark.

Machines with a draught of 0·7 metre can be taken on to land ; large machines may be moored to a buoy. There is a slipway with a floating stage on each side for starting and landing. The slipway and stage extend across a sunk channel about 50 metres broad and about 1 metre deep. The channel runs W.–E. and extends about 175 metres out beyond the slipway. It is advisable to keep in the middle of the channel as the water on either side is very shallow at low tide. Parallel with the S. edge of the channel and about 25 metres distance from it, there is a wooden jetty 150 metres long, which is no longer used.

Outside the station there are two mooring buoys for flying boats, which are painted white. To facilitate landing in the dark a barge carrying lights has been established, which is lighted on request or whenever an aircraft is expected. The barge, which is anchored 500 metres 320° from Mellemfort, has its deck painted with red and white stripes ; the sides are white with a red ring. A horizontal and vertical ring of lights with a diameter of 5 metres is displayed. The



height of the horizontal ring above the water is 3 metres. The vertical ring indicates the direction of the wind, since the barge swings round with the wind.

(3) Plans of the aerodrome and seaplane station abovementioned are appended.

Authority :—Danish Notices to Airmen, Nos. 4 and 5. (Notices to Mariners, No. 39), 22.9.20.

(No. 111) France : Aerodromes, Seaplane Stations, Customs and Wireless Stations

NOTICE to Airmen No. 98, of September 24, 1920, is amplified and amended as follows :—

1. *Aerodromes and Seaplane Stations—Additions*

Ajaccio (Lat. 41° 56′ N., Long. 8° 45′ E.) is a civil landing ground situated on the Island of Corsica immediately to the north of the town of Ajaccio. There are three Bessoneau hangars and a workshop, but no supplies or spare parts.

Antibes (Lat. 43° 35′ N., Long. 7° 07′ 30″ E.) is a civil alighting place for seaplanes, situated immediately north of the town of Antibes. One Bessoneau hangar exists, but there are no supplies or repair facilities.

Avignon (Pujaut) (Lat. 43° 59′ 30″ N., Long. 4° 46′ E.) is a civil emergency landing ground, situated 6½ kms. (about 4 miles) N.W. of Avignon, at an altitude of 185 ft. There is a wind sleeve in the eastern corner of the ground. The ground is marked in the centre by a circle 100 metres in diameter. No accommodation, stores and facilities for repairs exist.

Carcassonne (Lat. 43° 13′ N., Long. 2° 18′ 30″ E.) is a civil emergency landing ground, situated 3½ kms. (2¼ miles) W. of Carcassonne, on the north side of the Carcassonne–Montreal road, at an altitude of 385 ft. One Bessoneau hangar exists, but there are no supplies or repair facilities.

Montpellier (Lat. 43° 32′ N., Long. 3° 53′ E.) is a civil emergency landing ground, situated at Villeneuve-les-Maguelonne, 8 kms. (5 miles) S. of Montpellier, on the shore of the Étang de l'Arnel, approximately at sea level. Two Bessoneau hangars exist, but no stores or repair facilities.

St. Dizier (Lat. 48° 38′ N., Long. 4° 54′ E.). Military aerodrome 3 kms. (2 miles) west of Saint Dizier. Pilots who may be forced to land on this aerodrome must use the ground situated on the south of the Vitry-le-François–St. Dizier

road. The ground to the north of this road, although the Bessoneau hangars still remain, has been given over to cultivation and is cut up by numerous irrigation ditches.

Note.—This aerodrome is not included in the list of French military aerodromes which may be used by British civil pilots, and is therefore only to be used in emergency.

Kassar Said (Tunis). The aerodome is used by the artillery on Monday, Tuesday, Wednesday and Friday every week from 0600 to 0800 hours. During these hours use of the aerodrome by aircraft is prohibited.

Amendments

Lyons (le Bron). The position of this aerodrome is Lat. 45° 44′ N., Long. 4° 56′ E., 6 kms. (3¾ miles) S.E. of Lyons.

Nîmes. The latitude of this aerodrome is 43° 51′ 30″ N.

St. Inglevert. The position of this aerodrome is approximately 11 kilometres (7 miles) S.W. of Calais. The wireless mast outside the boundary of the aerodrome near the Boulogne–Calais road has been abolished. The lighthouse has been moved to a position in the south-eastern corner of the aerodrome, south of the hangars.

Valenciennes is not included in the latest list of French civil aerodromes and landing grounds, and should therefore no longer be used.

2. Wireless Telegraph Stations—Additions

The following W/T stations have been established by the Service de la Navigation Aérienne :—

Station	Type	System	Call Sign	Wave-length	Remarks
				metres	
Toulouse	E.13	Continuous wave	AV	1400	Works with Bordeaux, Nîmes and Lyons (both transmission and reception) and Le Bourget (reception only).
Nice ..	E.13	Continuous wave	AK	1400	Works with Nîmes and Lyons (both transmission and reception).

3. Meteorology—Additions

The following meteorological stations were opened by the Service de la Navigation Aérienne on September 1, 1920 :—

Le Bron, district station ; Marignanc (Étang de Berre), district station ; Nîmes, principal station ; Antibes, principal station ; Montelimar, secondary station.

(No. 109) Aerodrome List Amendments

AMENDMENTS to Notice to Airmen, No. 106 (Consolidated List of Aerodromes), of October 1, 1920, are as follows :—

LIST C (*b*).—*Licensed Civil Aerodromes. Civil Aerodromes Licensed as "Suitable for Avro 504 K and Similar Types of Aircraft only."*

The following should be deleted :—

Aerodromes.				Nearest Railway Station.	Nearest Town.		
Name.	Lat.	Long.	Height above sea-level.		Name.	Distance from Aerodrome in miles (by road).	True Bearing from Aerodrome.
			ft.				
Brighouse, Thornhills Lane	53° 42′ 30″ N.	1° 45′ 30″ W.	400	Clifton Road (L. & Y.R.) 1 mile	Brighouse ..	1¼	S.W.
Northampton, Mill Road	52° 14′ 0″ N.	0° 54′ 30″ W.	190	Northampton (L. & N.W.R.) ½ mile	Northampton	½	N.E.
Skegness	53° 8′ 0″ N.	0° 20′ 0″ E.	15	Skegness (G.N.R.) ½ mile	Skegness ..	½	N.N.E.
Wrexham	53° 3′ 0″ N.	3° 0′ 0″ W.	290	Wrexham (G.C.R. and G.W.R.) ½ mile	Wrexham ..	½	S.E.

(No. 110) Meteorological Reports issued by W/T from Air Ministry and Aberdeen

1. On and after October 6, 1920, the *synoptic reports* issued by W/T from the Air Ministry and Aberdeen will be as follows :—

Air Ministry.—Call sign, G.F.A. ; wave-length, 1,400 m. continuous wave ; times of issue, 0205 G.M.T., 0805 G.M.T., 1405 G.M.T., 1905 G.M.T.

Aberdeen.—Call sign, B.Y.D. ; wave-length, 3,300 m. ; times of issue, 0230, 0830, 1430, 1930.

2. The form of the reports and the codes will remain unaltered.

3. This notice amends paragraph 1 of Notice to Airmen No. 94, of September 1, 1920.

(No. 112) Belgium : Aerodromes and Customs Station

1. Aerodromes

HAREN, military and civil aerodrome (Lat. 50° 52′ 30″ N., Long. 4° 25′ 30″ E.) is situated 5 kms. (3 miles) N.E. of Brussels, on the communal ground of Evere and Haren villages. This aerodrome was formerly known as Haren-Evere.

Grand-Bigard, military aerodrome, is situated 5 kms. (3 miles) west of Brussels. This aerodrome was formerly known as Berchem-Sainte-Agathe.

2. Customs Station

Haren (formerly Haren-Evere) is at present the only Customs aerodrome in Belgium.

(No. 113) Blasting and Dredging Operations near Felixstowe ; Warning to Pilots

1. *Harwich Harbour.*—The Admiralty is carrying out submarine blasting operations during the hours of daylight only, at the entrance to Harwich Harbour (in position Lat. 51° 56′ N., Long. 1° 18′ 30″ E.) for the purpose of removing underwater obstructions remaining from the line of dolphins situated near the Cliff Fort rocks. The work will probably continue until about the 28th instant. A red flag will be hoisted on the firing boat, and a whistle sounded for two minutes before any charge is fired. Pilots or Navigators in charge of aircraft are therefore warned to keep a sharp look-out when in the vicinity of Harwich Harbour during this period.

2. *Felixstowe Dock Entrance.*—Dredging operations are now in progress at the entrance to Felixstowe Dock.

3. *Authority.*—Admiralty notices to mariners : No. 1596 of October 7, 1920, and No. 1609 of October 9, 1920, respectively.

(No. 114) Government Aerodromes : Prices of Aviation Spirit and Oils to Civil Pilots

1. The following prices for aviation spirit and lubricating oils issued at Government-owned aerodromes to civil pilots will be charged until further notice :—

	Per gallon, exclusive of container. s.	d.
Aviation petrol	4	4½
(If tins are takes away, 3*s.* per tin will be charged.)		
Motor spirit, Grade 1	4	0½
,, ,, ,, 3	3	10½
(Prices in Scotland and Ireland, 1*d.* more in each case.)		
Castrol R. lubricating oil	10	3
Oil, mineral thick	4	8
,, ,, thin	4	8
Castor oil, pure pharmaceutical	9	5
,, ,, treated	9	7

2. No issue of aviation spirit will be made unless the commanding officer of the issuing unit is satisfied that the spirit is intended solely for flying purposes. Motor spirit will be issued only in cases of utmost urgency.

3. Notice to Airman No. 100 of September 24, 1920, is hereby cancelled.

■ ■ ■ ■

Medals for Air-Raid Work

IN the parade ground of the London Fire Brigade, Southwark Bridge Road, S.E.1, Lord Crewe, H.M. Lieutenant of the County of London, on October 23 presented 63 medals of the Order of the British Empire, most of which had been won during air-raids. The greater number of the recipients were members of the fire brigade, though a clergyman, a doctor, and other civilians were among those honoured.

FLIGHT
The Aircraft Engineer and Airship

THE NEW STAAKEN MONOPLANE

An Interesting German All-Metal Machine

RUMOUR has been busy of late with a wonderful new German all-metal machine which was alleged to be designed for the transatlantic flight. The machine is now completed, and has made several test flights, but although she is wonderful in many ways she is *not* meant for the Atlantic journey. The new machine to which reference has been made is a Zeppelin production, hence it does not come as a surprise that she is built of metal throughout. This firm has had extensive experience in metal construction, not only in their airships, but also in the building of a number of all-metal machines, among which may be mentioned a series of sea-planes designed by Herr Dornier.

The new Staaken monoplane has been designed by Herr Küring, and is more or less a cantilever monoplane. We say more or less because although the wings are of the thick high-lift section which one associates with cantilever wings, they have a couple of lift wires underneath. There is no top bracing, however. The wings are attached to roots growing out of the body, which is very roomy. The four 260 h.p. Maybach engines are built into the wings, with their housings projecting slightly above and below the wing surfaces. The inner engines are as close to the body as the propellers will allow, but the outer engines are placed about 16 ft. out from the centre line. This is the feature we like least of all in the design, as the turning effort in case of one of the outer engines stopping must be uncomfortably great, necessitating, one would imagine, the throttling down of the corresponding engine on the other side, and thus in effect losing half the power in case of a breakdown of one engine.

In other respects the arrangement has much to recommend it. For instance, the propellers are well clear of the ground, and there is little danger of damaging them. By taking off the top cowling the engines can be lifted out of their *nacelles* by a travelling crane, as there is no bracing to negotiate. In case of engine trouble during flight, a mechanic can crawl along small tunnels inside the wings and get into the engine *nacelles* without having to come out in the open.

The *fuselage* is of very generous proportions, and seating accommodation is provided for 18 passengers. There is one row of seats along each side of the cabin, and a third row down the centre. The pilot and engineer are placed above the cabin, with their heads in the open, but in spite of this, the view is not particularly good, being obstructed by the large chord wing roots. Four large landing wheels are provided, or rather two double wheels, sprung by long telescopic tubes to the wings. The travel of the wheels is extraordinarily great, making the machine very comfortable to land. A pair of smaller wheels under the nose of the *fuselage* prevents nosing over when on the ground.

The weight of the machine empty is about 12,000 lbs., and fully loaded 18,700 lbs. The wing span is approximately 100 ft. When carrying fuel for a journey of about 600 miles the machine can carry 12 passengers, and for a flight of about 300 miles, 18 passengers can be carried. The maximum speed is claimed to be about 110 m.p.h., and the machine gets off in 170 yards, and pulls up in about 150 yards. As already mentioned, the Staaken monoplane is built of metal throughout, mostly of Duralumin, the only wood being the floor boards of the cabin. As the petrol tanks are carried inside the wings, between the inner and outer engine *nacelles*, there should be little danger of fire.

THE ROYAL AIR FORCE MEMORIAL FUND

A MEETING of the Executive Committee was held at 7, Iddesleigh House, Caxton Street, S.W. 1, on Wednesday, October 20, Lord Hugh Cecil in the chair.

A list of donations to the Fund since the last Meeting on September 30 was presented, and included the munificent donation of £5,000 from Viscount Cowdray.

The scheme for establishing a Boys' Home for Sons of Airmen at Vanbrugh Castle, Blackheath (which property has been generously presented to the Fund by Mr. Alexander Duckham) was considered and a Sub-Committee, of which Sir John Salmond is Chairman, was authorised to proceed with the scheme.

The question of a concrete Memorial for the Royal Air Force, to be erected in London, to commemorate the fame of the Officers and men of the R.N.A.S., R.F.C., Australian F.C., and the Royal Air Force, including Officers and men who joined the Force from the Overseas Dominions, was considered. The selection of a site and the character of the Monument were discussed.

The Sub-Committee reported that it was engaged on the task of drawing up a scheme for a fund-raising campaign, in large industrial centres throughout the Kingdom, which would embrace visits by selected speakers among the list of Vice-Presidents and members of the Executive Committee, together with senior Officers of the Royal Air Force. The co-operation of Lords Lieutenant of Counties, Lord Mayors, Mayors, and leading Citizens to be enlisted in the cause.

The question of the manner of co-operation of the Fund with existing organisations, as regards relief to necessitous Officers and men, and their families, was discussed, and a concrete scheme formulated. The R.A.F.M.F. will work in close co-operation with the Flying Services Fund (administered by the Royal Aero Club) and with :—

(1) The Officers' Association, as regards all Officers, R.A.F.

(2) The Officers' Families Fund, as regards wives and dependents of Officers.

(3) The Soldiers' and Sailors' Help Society, as regards other ranks, R.A.F.

(4) The Soldiers' and Sailors' Families Association as regards wives and dependents of other ranks.

The R.A.F.M.F. either to make payments direct to applicants, or to repay the above Societies, either in part or whole, as regards help given by them to members of the Royal Air Force.

It was decided that the Fund could not set up the machinery necessary to make detailed investigation of cases, but it is assured that the above-mentioned Associations and Societies will generously do this needful work on their behalf.

The Secretary reported that £55 had been received from India (Punjab) and that more help was coming from that source.

	£	s.	d.
Amount of subscriptions announced up to September 30, 1920	96,006	0	5
Amount received since, to October 19, 1920	5,119	4	4
Total to date	£101,125	4	9

NOTICE TO GROUND ENGINEERS

No. 13) Handley Page 0/400 Tail Plane Fittings

1. ATTENTION is drawn to the undermentioned tail plane fittings on the Handley Page 0/400 and cognate types, *i.e.*, 0/7, 0/10, 0/11 and 0/14.

(1) The rudder post attachment fittings (top and bottom) on rear tail plane spars.

(2) The strut attachment fittings (top and bottom) on front tail plane spars.

Instances of the failure of these parts have been discovered, which if undetected might result in failure of structure. The first signs of failure are small cracks which develop at the base of the lugs supporting the rudder post and interplane struts.

2. Owing to the weakness of these fittings owners of all British registered aircraft concerned have been notified that the Certificates of Airworthiness of the machines in question will be suspended unless the following action be taken :—

(*a*) Close inspection of the fitting must be made forthwith, and if no signs of failure are observed, further inspection must be made after every succeeding period of thirty hours' flying. For the purpose of these inspections the fabric should be kept permanently removed from the rudder post fittings.

(*b*) In cases where the part is found to have weakened it must be replaced immediately, and before any further flying takes place, by a new fitting, as shown on Drawing A.D. 2963.

(*c*) In cases where no sign of weakness has yet shown itself the above replacement need not be made until the aircraft requires complete overhaul, provided that a strengthening clip, as shown on Handley Page Drawing 932, is fitted over the existing fitting within a week of the date of this Notice.

3. Ground engineers are reminded that they cannot issue a Daily Certificate of Fitness to Fly in the case of aircraft for which a Certificate of Airworthiness has been suspended.

THE PRESENT POSITION OF AIRCRAFT RESEARCH AND CONTEMPLATED DEVELOPMENTS*

By Air Vice-Marshal Sir E. L. ELLINGTON, K.C.B., C.M.G., C.B.E., Director-General of Supply and Research

THE paper read by Sir E. L. Ellington before the Air Conference on October 13, 1920, was a very interesting one, stating as it did the directions in which the Air Ministry expect or desire aircraft, engines, and accessories to develop, and the steps which they are taking to bring about the development they require. Unfortunately, space will not allow of publishing the Air Vice-Marshal's paper in full, but in the following notes an attempt has been made to give a *résumé* of the main points made by the speaker.

After pointing out how, during the War everything was sacrificed to obtain performance, and how cost mattered very little and durability not at all, as a machine had a short life in any case, due to enemy action, bad aerodromes or obsolescence of types, the speaker mentioned that as a consequence we had, at the conclusion of the War, a number of machines and engines which, although efficient for the purposes of the moment, were direct developments of their predecessors of 1914. In other words, the development may be described as conventional rather than radical. The same applied to a great extent to airships.

In the matter of accessories the progress was more radical. Sir E. L. Ellington pointed out how progress was made in the carrying of machine guns on board aircraft, in interrupter gears for them, in navigational instruments, in wireless, both telegraph and telephone and directional. Having given this brief historical account of the progress made during the War, and thereby indicating the starting point of the Air Ministry's peace programme, the speaker turned to the main subject or his paper, which was dealt with under the following headings: Aeroplanes, Seaplanes and Engines. Airships and Kite Balloons. Navigational Instruments. Accessory Developments to increase the Comfort, Safety or Efficiency of the Crew and Passengers. He suggested that the following qualities are required in the perfect aeroplane or seaplane: Reliability, ease of control, power to land and get out of the most restricted places. Good performance, and cheapness of construction and maintenance.

Reliability, the Air-Marshal said, is principally a matter of the engine accessories outside the engine itself, such as the petrol supply, and lubrication, ignition, and water systems. Improvements in this respect should be brought about by close study of details, such as the possibility of using metallic joints in the petrol system, improvements in petrol pumps, or new designs of pumps which will prove more reliable.

Besides endeavouring to obtain improvements in engines of the normal type two engines are, the speaker said, being developed, which are of an entirely different type. One of these is a swash plate engine, that is to say one in which an inclined disc on the shaft takes the place of the crank in the ordinary engine. Such engines have been used for steering gear in submarine work, and an engine of this type for aeronautical purposes shows considerable promise. It is expected that such an engine will develop considerably greater power for a given weight than either a rotary radial, Vee or straight engine of the ordinary type. Or, conversely, an engine of a given power should be designed for a lower weight. The advantage of such an engine, in addition to low weight, is that, since the cylinders will lie parallel to the shaft, the fuselage can be designed to give low resistance.

The second engine to which reference has been made is a steam turbine. It is believed that the limit to which it is feasible to make the cylinders of an ordinary engine is somewhere about 100 h.p., and as it is not desirable to increase the number of cylinders largely, any increase in power, and it appears likely that such an increase will be wanted, may possibly be better attained by an engine of different type. The Air Marshal mentioned as the largest petrol engine now in course of construction the Napier "Cub" with 16 cylinders and designed to give 1,000 h.p. He said it was thought that the steam turbine was worth experimenting with. One of the greatest difficulties in connection with the steam aero engine was the design of an efficient condenser within the limits of permissible weights. The desiderata for aero engines were enumerated as follows: Low power-weight ratio. Low fuel consumption. Reliability. Safety from fire. Long life. Simplicity and accessibility. Ease of starting. Use of fuel of high flash point. Ease of control from a distance. Silence. Reversibility. Maintenance of power at great altitudes. It is thought that the steam engine would fulfil all these conditions except, possibly, the first. Failure of the ignition system may be eliminated by doing away with external ignition altogether, and investigations are being made, concerning the application of the Diesel principle to aero engines.

Concerning the question of ease of control, the Air-Marshal pointed out that as machines increase in size the physical effort of the pilot increases and means are sought for relieving him of some of the work. This may be accomplished by balanced control surfaces or by the use of servo motors. At the R.A.E. experiments are being made with automatic mechanical control of machines, both longitudinally and laterally, use being made of a gyroscope.

Accessibility of the engines during flight is of importance, and three machines are now under construction or consideration with the engines in a central engine room. One of these is a boat seaplane designed by Messrs. Wm. Beardmore, in which two propellers on the wings are driven through gearing and shafts by four engines in the hull. The second machine is being constructed by the Bristol Company for the Air Ministry. This has four engines, all geared together, which drive two propellers through gearing and shafts. The third machine, which is only in the design stage, is to have one or two engines in the *fuselage*, driving two propellers on the wings.

The Air-Marshal then pointed out the advantages of machines capable of getting out of or alighting in restricted areas and called attention to two forms of wings which aimed at attaining this. One was the Fairey, in which the whole trailing edge is pulled down, this virtually increasing the camber of the wing section. The other was the Handley Page wing, in which the wing has a false leading edge, separated by an air space from the leading edge proper. The speaker also pointed out the advantages of the amphibian aeroplane, while on the subject of the helicopter he said that theoretically such a machine is possible, but it still remains to be proved whether such a machine can be designed sufficiently simple in its details to be reliable in practical use.

On the question of performance the Air-Marshal stated that here there is a marked divergence in the aims of designers of civil and military machines. The former does not require such a high performance as that which is essential to the latter, and a sacrifice in weight can therefore be made in order to obtain reliability. For military machines the air-cooled engine is less vulnerable than the water-cooled, and the most promising type appears to be the radial air-cooled, of which several are being developed. It is generally believed that with about 200 h.p. the limit of the rotary engine has been reached, but a designing firm is investigating a differential rotary in which the shaft and propeller rotate in one direction and the cylinders in the others.

Cheapness of construction and maintenance is of first importance in a civil machine, and as cheapness of construction goes with simplicity, and therefore ease and rapidity, it is also of great importance for war purposes. Aircraft as the War has left them are flimsy structures, requiring continual looking after, and it is therefore desirable to seek a system of construction which will provide a stronger and more durable machine. The solution of this problem probably lies in the use of metal. The speaker then pointed out the German example provided by the Junkers cantilever wing machine, and said that if it is found possible to introduce into planes so constructed elements which can be adjusted in flight so as to give low resistance for actual flying and high lift for landing and getting off, a very great step will have been made in the development of the aeroplane. "A machine," the Air-Marshal said, "is now being designed in this country in accordance with the Woyevodski Patents, in which the depth and structure of the wings is such that engines can be installed within the wing structure. Such model tests as have been made so far tend to show, as might be expected, that aerodynamically there is great advantage in such a design. It is further suggested that the undercarriage should draw up in flight within the main structure of the machine. Should this prove practicable we shall be approaching finality in the matter of reduction of resistance in a machine driven by an airscrew."

Sir E. L. Ellington then referred to the subject of forced induction and variable pitch propellers, pointing out that the former is of little use without the latter, and stating that although much work has been done on variable pitch

* Extract from a paper read before the Air Conference.

propellers, no completely satisfactory design has been evolved which can be relied upon to stand up to the great stresses to which propellers are subjected by modern high-power aero-engines.

With regard to fuels, the speaker referred to the high cost and inflammability of petrol, and drew attention to the advantage of a fuel which, while being cheaper and giving a lower consumption than the .5 lbs. h.p. hour of petrol, is less inflammable.

Rigid Airships.—The Air-Marshal pointed out that during the War rigid airships constructed in this country were copies of German Zeppelins. He stated, however, that two airships, the "R.80" and the "R.38," are now nearing completion, and that in their design considerable departures have been made from standard German practice. The size of the "R.80" was restricted by the dimensions of the construction shed of Vickers at Barrow, but the "R.38" is a considerably larger ship than has previously been constructed in England. The recently surrendered German airships "L.71" and "L.64" have afforded an opportunity of comparing the latest German practice with that followed in this country, and the most interesting characteristics of these ships are the construction of their gasbags, which are very light, and the arrangement and reliability of their machinery. The anticipated use of airships in tropical countries has made it desirable to carry out investigations on the deterioration of both gas-tight and outer covers when exposed to tropical conditions, and such investigations are now being made.

Improvement is required in the machinery of large ships, and experiments are now being made with the development of a standard airship power unit, containing the most reliable engine and fitted into the most reliable arrangement of installation. Owing to the fact that weight is of less consequence in airships than in aeroplanes, it appears probable that the first use of engines of the Diesel type in aircraft will be in airships. Experiments are also being carried out on the recovery of water from the exhaust gas of the engines in order to avoid the necessity of discharging gas.

Concluding his reference to airship problems, the speaker mentioned the mooring tower, which gives promise of mooring out an airship in any weather, necessitating return to its shed for thorough overhaul only.

Referring to the difficulties of landing in a fog, the Air-Marshal pointed out that once above the fog, modern instruments enable a pilot to keep a good course, and with regard to the difficulty of landing in a fog experiments were being carried out and progress made. Mechanical dispersion of fog had been tried but did not promise early results. The illumination of landing grounds is practicable up to a certain degree of mistiness, and is the same as that used for night landing, *i.e.*, flares and powerful lamps. Systems of carrying powerful electric lamps on the aeroplanes are being developed. The mechanical landing of an aeroplane is also being tried. The gliding angle of any aeroplane and speed corresponding to this angle is known, consequently if it is possible to indicate to a pilot his height above an aerodrome and the direction he has to fly, he can, by putting the machine at its gliding angle at the proper moment, make sure of landing within the aerodrome. To flatten out the machine at the right moment a mechanical arrangement was tried at Farnborough. This consisted of an arm extending below the *fuselage* and attached to the controls. When this arm touched the ground the controls were moved by it and the machine flattened out. In order to prevent it from bouncing, a special tail skid had to be designed, which brought up the tail after once having touched.

Two methods are under investigation for indicating to the pilot his exact height above the ground. The first makes use of the noise of the engine, which is caught in a series of microphones on the ground, enabling the height of the machine to be ascertained and transmitted to the pilot by wireless. In the second use is made of a proximeter, which depends upon the principle that when electrical oscillations are set up in any circuit, the frequency of these oscillations depends upon the electrical capacity of that circuit.

On the subject of safeguarding crew and passengers of aircraft, Sir E. L. Ellington referred to the danger of fire, and its reduction by self-sealing tanks and by fireproof bulkheads between the engine and rest of the machine. The provision of parachutes is a controversial matter and can really only be settled by the provision of parachutes and experience extending over a long period. It has been decided that new R.A.F. single-seater and two-seater machines are to be provided with parachutes, and existing machines of these classes will be provided with them where possible. Finally, the speaker mentioned mechanical engine starters, and mentioned as a promising solution a small auxiliary engine developing about 1½ h.p. and weighing, with its piping, etc., about 40 lbs.

The Discussion

In the discussion which followed the reading of Sir E. L. Ellington's paper several valuable suggestions were made.

Sir Richard Glazebrook

said he thought his best plan would be to outline the organisation of research and education. Sir Richard mentioned the National Advisory Committee for Aeronautics, the Aeronautical Research Committee, and the establishment of the first Zaharoff professorship in aeronautics at the Imperial College at South Kensington. These institutions are, however, so well known to readers of this journal that there is no need to refer to them here. Sir Richard then gave an account of the various bodies and sub-committees which are dealing with the various problems outlined in Sir E. L. Ellington's paper. With regard to the staffs at the N.P.L. and at the R.A.E., he said he hoped that provision would be made to maintain these on an adequate scale so that efficiency should not be made to suffer as a result of economy.

Lieut.-Col. Moore-Brabazon, M.P.,

stated that he was charging the speaker with sins of omission rather than sins of commission. Thus no reference had been made to the part played by aerial photography in the War. The photography section issued a bagatelle of something like two million prints per month towards the latter part of the War. From a very crude beginning the cameras used had developed very considerably, although they were certainly nowhere near perfection yet. He then outlined some peace time uses for aerial photography, such as mapping, and checking the growth of crops. He also referred to the manless aeroplane, controlled by wireless, and thought that we should go on with the experiments, as such a machine would have its uses in war, such as, for instance, torpedoing battleships or ramming enemy aeroplanes.

Capt. F. M. Green

pointed out that time is needed for reconsidering aeroplane design. There are, he said, two important factors which enter into future design: One is broader data from the results of experimental research, and the other is the technique of detail design. He pointed out the very great importance of the details of an aeroplane as a structure, and said that instead of the criticism that aeroplanes were bits of sticks and string, the modern machine should be the finest engineering structure in existence. He expressed the hope that the trained draughtsmen would not all be lost to the industry, and pleaded for generous treatment in the matter of new designs, as being the best way of keeping designing staffs together. He would like to point out one omission in the paper: No reference had, apparently, been made to the view of the pilot. In the future this would be very important in commercial machines, and would help the pilot under adverse conditions, as well as help to prevent collisions when the air became more crowded. With regard to the swash plate engine he confessed that he was somewhat sceptical. The development of the steam engine was interesting, but he rather thought the fuel consumption would be a little high. He agreed that metal construction of machines must come sooner or later. He was not sure that the cantilever wing was superior as regards vulnerability, since the wires were there just the same, they were merely put inside. He thought the wing should be developed, however, as it might have other advantages. With regard to the variable camber wing, he was not very hopeful. Experiments at Farnborough in 1914 were not very promising. Mention had, he said, been made of the N.P.L. and the R.A.E. While he was fully alive to the importance of these two institutions, he would call attention to another very important one: the Air Station at Martlesham, which was the only place where one could have a machine tested.

Mr. Alan Chorlton

said that at present he thought the demands of aircraft constructors were too vague. He thought it would be of great assistance to engine designers if the demands would be more definitely stated. There were, he said, two schools, so to speak. One wanted the heavier built, economical engine, and the other the light engine, run at less than full throttle for most of the time. For short flights, as for instance, London-Paris, the light engine of about 2 lbs. h.p. might be the better. For longer flights, when consumption became of more importance than engine weight, a weight of 4 lbs./h.p. could be tolerated. He said he was interested to learn that the steam engine was to be developed. He

thought this subject might with advantage be dealt with in a lecture at the Royal Aeronautical Society. His own opinion was that the turbine would be rather extravagant in fuel consumption, and expected an efficiency of about 15 per cent. only, as compared with the 30 per cent. efficiency attained with the petrol engine. With regard to the Diesel engine, he objected to this name being used for the engine referred to, as that was entirely British and worked on a different cycle. This type of engine was heavy, but as its fuel consumption was low it might be suitable for long-distance flights. Supercharging was generally looked upon as a means of maintaining power at heights. It could be employed also for increasing the power by as much as 25 per cent. for a short time, while getting off, for instance, and also for greater economy while actually flying. With regard to the limit in the size it was possible to make the petrol engine, he said that his opinion was that if engines of 4,000 h.p. were really wanted he saw no great difficulty in providing them, and they would be produced in a few years if the demand arose.

ROYAL AERONAUTICAL SOCIETY NOTICES

Election of Members.—The following members were elected in the various grades as shown at a Council Meeting held on October 19. *Fellows*: Lieut.-Col. W. A. Bristow, The Rt. Hon. Lord Weir of Eastwood. *Associate Fellows*: Flight-Lieut. J. C. Atkinson, J. W. Copley, W. E. Dumbrill, B.Sc., J. E. Jones, B.Sc., H. Rogerson, Capt. C. G. Sturt, A.F.C., Capt. L. J. Wackett. *Students*: H. R. Cox, S. H. Evans, P. T. Griffith, J. P. Rathbone, G. M. Scott, F. G. Whitmore, Chaucer Wood. *Members*: W. J. Adderley, Flight-Lieut. C. Russell Cox, Lieut. C. G. Little, U.S.N. *Associate Members*: E. P. Appleby, Flight-Lieut. C. Hilton Keith, A. Ruthven-Stuart, Lieut.-Col. H. Laws Webb, F. J. McConnel. *Foreign Member*: Lieut. H. Sorensen, Danish Navy.

Scottish Branch.—Fellow: Prof. A. H. Gibson, M.Inst.C.E., F.R.S.E. *Associate &ellows*: A. E. Marsden, H. E. Yarrow, C.B.E., M.Inst.C.E. *Associate Members*: A. M. Kay, R. G. Millar, A. Page, T. H. Storer. *Student*: A. Cairns.

Annual Dinner.—The Annual Dinner will take place in the Connaught Rooms at 7.30 p.m. on Wednesday, November 17. The Right Hon. Lord Weir of Eastwood, President of the Society, will take the Chair. Tickets (price one guinea exclusive of wines) may be obtained from the secretary, and members are invited to bring guests. Ladies will be welcomed.

Air Mail.—It has been decided that in future letters will be sent by Air Mail in the case of all correspondence to countries which are so served. It is felt that if all members of the society would follow the same course, practical assistance would be given to the development of commercial aviation.

Library.—The following book has been received and placed in the library: "Commercial Airships," by H. B. Pratt, M.I.N.A.

Lectures.—The following papers will be read during the month of November, in each case in the theatre of the Royal Society of Arts:—

November 4.—"The Human Machine in Relation to Flying," by Wing-Com. M. Flack; Sir Humphrey Rolleston, K.C.B., M.D., F.R.C.P., will take the Chair at 5.30 p.m.

November 18.—"The Problem of the Helicopter," by M. Louis Damblanc, the French consulting engineer, who is carrying out experiments on behalf of the French Government. This meeting willl commence at 5 p.m.

W. LOCKWOOD MARSH,
Secretary.

Married

Squadron-Leader DOUGLAS CLAUDE STRATHERN EVILL, D.S.C., A.F.C., R.A.F., only child of Dr. and Mrs. Evill, of Barnet, Herts, was married at Christ Church, Down Street, W., on October 8, to HENRIETTA HORTENSE, younger daughter of Sir ALEXANDER KLEINWORT, Bart., and Lady KLEINWORT, of 30, Curzon Street, Mayfair, and "Bolnore," Haywards Heath, Sussex.

Capt. H. T. HORSFIELD, R.A.F., son of Mr. and Mrs. Thomas Horsfield, of Evesham, Worcestershire, was married on October 6, at Brompton Oratory, to LILY, daughter of the late JULIUS MUIR, Indian Civil Service, and Mrs. MUIR, of 33, Trevor Square, Knightsbridge.

To be Married

The marriage of Flt.-Lieut. ALAN G. BISHOP, A.F.C., R.A.F., and Miss VANDA PAMELA DAVIES will take place at St. Saviour's Church, Brockenhurst, Hants, on November 6, from Walden, Brockenhurst.

The engagement is announced between Capt. BRIAN ALEXANDER SPENCER-LEWIN, R.A.F., son of Lieut.-Col. and Mrs. Spencer-Lewin, of Ifield, Sussex, and grandson of the late Mr. J. P. A. Lloyd-Philipps, J.P., D.L., of Dale Castle, Pembrokeshire, to VIOLET, eldest daughter of Sir DAVID and Lady HUGHES-MORGAN, of Penally House, Penally, Pembrokeshire.

THE marriage of Lady MAUREEN STEWART, daughter of Lord Londonderry, to the Hon. OLIVER STANLEY, son of Lord Derby, will take place in Durham Cathedral on Thursday, November 4.

Items

THE will of Mr. IORWERTH HENRY MAURICE HUMPHREYS (29), of the Rectory, Braunston, near Rugby, Northants, Director of Aircraft Production, Ministry of Munitions, has been proved at £1,238.

Information has been received from the British Mission in Berlin that Capt. DWYER NEVILLE, R.A.F., who was among the British officers captured by the Bolsheviks in Siberia last December, is in prison in Moscow.

The Air Navigation Bill

IN the House of Commons on October 22, Mr. Churchill moved the following resolution:—

"That it is expedient to authorise the payment, out of monies provided by Parliament—

(*a*) of such sums as may be required for the contribution from the United Kingdom under any Act of the present Session to enable effect to be given to a convention for regulating air navigation, and to make further provision for the control and regulation of aviation; and

(*b*) of any expenses incurred by the Secretary of State or the Air Council in the exercise of their powers under any such Act."

He said it was a purely formal resolution to regularise the position of the Air Navigation Bill, which had received its second reading on August 9, and was committed to Standing Committee A. It was necessary to pass it to enable the Standing Committee to carry on its work.

In the brief debate Commander Kenworthy protested against the small amount of financial support given by the Government to commercial aviation. The resolution was agreed to.

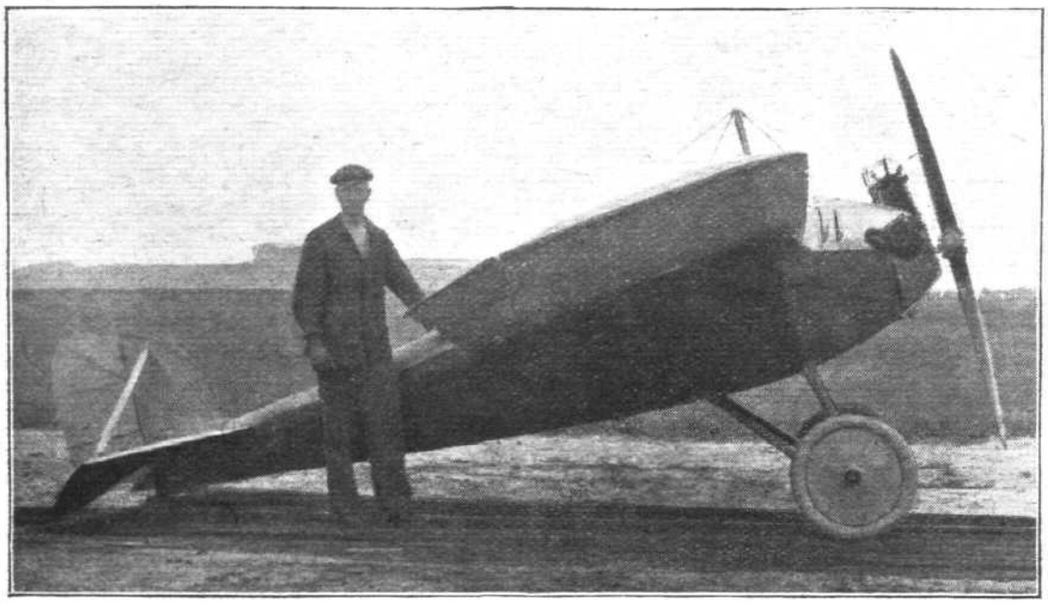
FLIGHT

THE SABLATNIG K.E.1 SPORTING MONOPLANE

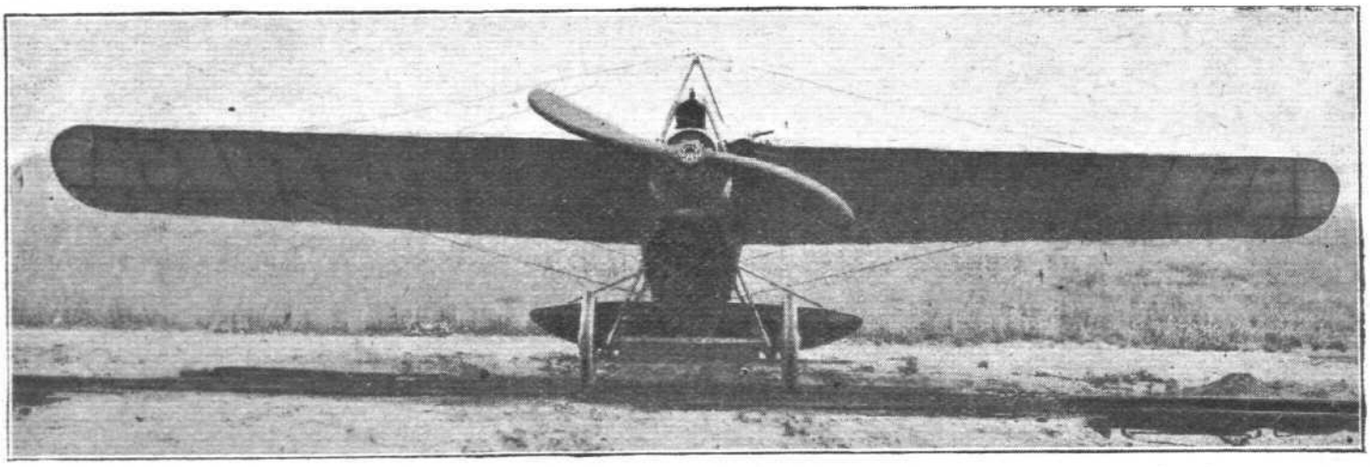
20 H.P. B.A.W. Engine

AMONG the German designers little known in this country, but well worth watching, is Dr. Sablatnig, who started his aviation career as an Austrian pilot. If we remember right, he learned to fly in France, on a Nieuport, and later became pilot for the Union Werke, Berlin. Although an Austrian, Sablatnig served during the War in the German Naval Air Service. While with this service he first attracted attention by designing an undercarriage arrangement with which the rear ends of the floats were drawn upwards against the action of springs, thus increasing the angle of incidence and enabling the machine to make a quicker get off than was otherwise possible. The arrangement proved successful, and Sablatnig was given permission to produce original designs. He succeeded in getting financial assistance from a firm of Bankers (Molling), and produced several designs.

Since the cessation of hostilities Sablatnig has managed to get several of his designs accepted by the Inter-Allied Commission. Among the latest Sablatnig designs to be sanctioned is the little sporting monoplane Sablatnig K.E.1, shown in the accompanying photographs. This machine, which is of orthodox design, is a monoplane, with the usual monoplane bracing, and is chiefly remarkable on account of its low-powered engine, and for the fact that both its main planes and tail plane fold up for storage. The B.A.W. engine is a three-cylindered fan-type air-cooled of 20 h.p. only, with which the machine is said to attain a maximum speed of 110 km. per hour (67 m.p.h.). The span of the machine is 27 ft. 9 ins., and the overall length is 17 ft. 6 ins. The weight of the machine empty is 407 lb., and with pilot and 2½ hours' fuel she weighs 630 lb.



The Sablatnig K.E.1: Side view



THE SABLATNIG K.E.1: Front view

◈ ◈

Educating Germany

THE German Government evidently recognises the necessity of keeping the public fully informed of the developments in aviation at home and abroad, the German Aviation Minister having recently established a Press department for the purpose of disseminating aviation news, especially items relating to progress in other countries.

Endowing a Lectureship

IN this connection it may be noted that the German Under-Secretary for Air Transport has allotted a sum of 20,000 marks for the purpose of creating a lectureship on aviation at the Technical High School of Brunswick.

◈ ◈

Germans to Boycott Foreign Capital

FROM a message to hand from Berlin, it appears that the Aero Clubs of Kurhessen, Gross Thüringen and Saxony, have combined to form a national society. One of the resolutions passed, unanimously, at the inaugural meeting at Cassel, pledges the members to prevent, by all possible means, the investment of foreign capital in German Air Transport Companies.

FLIGHT

OCTOBER 28, 1920

A COMPARISON OF THE FLYING QUALITIES OF SINGLE AND TWIN-ENGINED AEROPLANES*

By Squadron-Leader R. H. HILL, M.C., A.F.C.

THERE is no doubt that the twin-engine types involve greater concentration in flying generally, simply because the pilot has more to look after; he has to cope with the difficulties met with every day in the single-engined type, but in addition he may meet with certain extra ones involved in the twin, the cumulative effect of which has undoubtedly led in some cases to crashes which might have been avoided had these difficulties been justly appreciated.

Undoubtedly, for pure flying, that is the pilot's part in the maintenance of an aeroplane in flight, control will be uppermost in the pilot's mind, and as such claim nearly all his attention in flight. Control may be roughly divided in two: control of the aeroplane, and control of the engine or engines.

I think that the key to the problem may be said to be the correct appreciation of how the two parts of the control re-act on each other. A failure to appreciate this, an attempt to treat subconsciously the two parts as separate involves grave confusion.

Firstly, when the power is completely shut off, the two elements of aeroplane and engine control are most nearly separate in the pilot's mind. Theoretically, with an aeroplane control complete in itself, a pilot might carry out any manœuvre whatsoever, using gravity as a motor. Even if the aeroplane control could be regarded as complete in itself, it has not up to the present been made complete enough to meet effectively the control requirements of the aeroplane between all engines on and no engines on.

Secondly, in practice, especially with twin-engined aeroplanes, the aeroplane control is not complete in itself. Although recourse to it alone is necessitated in a forced landing with no engine or engines, in which case the best possible use has to be made of it, in actual fact most modern aeroplanes pass the accepted standard of controllability, when their control at low speeds is bolstered up by the use of engine to assist the rudder for instance. If the same standard were demanded without any engine, many aeroplanes would fail to come up to it.

Even the most modern aeroplane engine may be controlled in two ways, firstly by the pilot, and secondly by mechanical faults, including faults in the petrol system. There will be two main considerations then: firstly, the effect of the engine on the aeroplane and the consequent movements of the controls as the pilot varies the power at will, or for some particular purpose, and secondly, the effect of sudden engine failure. If the pilot varies the power at will, he knows what he intends to do and therefore has a general idea of the effect on the aeroplane. The effect will be foreseen in the first case, may be violent and unforeseen in the second, and in general influences the aeroplane in four ways:—

(*a*) The presence or absence of slipstream will, by affecting the tail, influence the longitudinal and lateral trim of the aeroplane. (*b*) Simultaneously the position of the thrust axis or axes relative to the centre of gravity will do the same when the thrust is varied. (*c*) The engine torque varies with the horse-power developed, and naturally affects small single-engined aeroplanes to a much greater extent than large aeroplanes. (*d*) The gyroscopic effect of a rotary engine may influence the aeroplane when it is manœuvred.

Before considering in detail the effect of engine on the control of multi-engined, it will be well to examine shortly that of single-engined aeroplanes. This must be done just so far as it affects the pilot and his power of control over his aeroplane. Take the four effects mentioned, the most important of course is that of the slipstream on the tail. Assuming that the tail portion consists of a fin and a rudder tail plane and elevators, and that these are partly in the slipstream, various and sometimes unsymmetrical loads will be applied as the power varies. The air of the slipstream is washed downwards, and also given a rotary motion by the propeller. If it were possible to design the fin symmetrically in the slipstream, there would be no force on it. However, in practice, this is very difficult to achieve, owing to angle of incidence of the wings when landing and other considerations. Therefore in nearly all modern aeroplanes there is a tendency to turn one way with engine on; in some aeroplanes violently, in others less violently.

It may be noted in passing that it has been observed that the smaller the diameter of the propeller, the more violent is the action of the slipstream on the fin. A Lion D.H.9A. was turned out with a propeller of a certain diameter, and exhibited a violent turning tendency. By increasing the diameter of the propeller, the turning tendency was reduced to reasonable proportions.

Again, the slipstream acts on the tail plane. Most modern aeroplanes are provided with a movable tail, which is specially necessary on aeroplanes with high-powered engines, for the purpose of rendering the pilot's aeroplane control adequate to meet the control requirements from engine full on to engine off. It should be noted here that the tail cannot be operated very quickly, especially in the case of a wheel control. That is why, if possible, a lever should be provided apart from its other advantage of registering the position of the tail plane to the pilot.

Slipstream acting on a tail set at a negative angle will render the aeroplane more tail heavy engine on than engine off. According to the design of the aeroplane this feature is in evidence to a greater or less degree. Pilots naturally like an aeroplane which has a small difference of trim engine on and off. In some aeroplanes the range of movement of the tail plane is not sufficient to provide adequately for this difference of trim, and elevator control, which should be available for emergencies, has to be used up in trimming the aeroplane in what ought to be its normal range of flying speeds.

With stable aeroplanes it is possible to ascertain immediately whether the tail plane has sufficient range for flying requirements, as the aeroplane with elevators free will take up definite stable trimming speeds, if they exist; with unstable aeroplanes, or aeroplanes only stable at low speeds, the problem is more complicated, and it is necessary to measure the forces on the control stick.

(*b*) In most single-engined aeroplanes, the position of the axis of thrust, unless the aeroplane be designed for some special purpose, does not affect the pilot nearly so seriously as the effect of the slipstream. Its actual effect cannot be dissociated from that of the slipstream as it occurs simultaneously, but the axis of thrust is not usually at a great distance from the centre of gravity of the aeroplane. It should be noted that its effect may add to or subtract from that of the slipstream.

(*c*) The engine torque is in general a small effect. It was noticeable on the D.H.2 when the engine was switched on and off, and on other small span aeroplanes. If the engine is opened gradually the torque is difficult to detect, but with an engine like a Monosoupape Gnome, which is switched off and on without throttling, the effect on a small span aeroplane is at once apparent.

(*d*) As far as I know the gyroscopic effect of a large rotary engine, with one or two exceptions, only arises nowadays with single-engined aeroplanes, and so consideration of it hardly assists a comparison with multi-engined aeroplanes. However, on a single-engined aeroplane this effect is felt in almost every natural manœuvre that a pilot can carry out.

As the engine power is varied, its relations to the aeroplane control, as in (*a*), (*b*), (*c*) and (*d*) have been discussed as separate factors in a complex effect, such as the slipstream on the fin, or the position of the axis of thrust in its relation to the longitudinal control. But these in flight are so closely interrelated, at least to the feel of the pilot, that it may be well to consider the whole in relation to practical flying.

It might first be mentioned that the pilot may be flying along steadily and using his controls to overcome unsymmetrical forces due to, say, slipstream. The slipstream may disappear due to engine failure, and cause the unsymmetrical forces to disappear also. Because for the moment the pilot has become accustomed to them, the effect is just as upsetting as if the aeroplane were subject initially to symmetrical forces, and unsymmetrical ones were suddenly introduced. Any sudden change of trim may necessitate the use of the aeroplane controls to maintain rectilinear flight, and the ease of doing this depends on whether the pilot is near to the margin of his control or not.

If an inexperienced pilot flies an aeroplane with a strong turning tendency and a large alteration in longitudinal trim engine on and off, he may do something like this—he takes off with the tail wheel adjusted for climbing. He flies round, and before gliding in to land he winds the wheel full back. He throttles right down, glides in, and finds that he is going to overshoot badly. He decides to open the throttle and go

* Extracts from paper read before the Royal Aeronautical Society, on Oct. 21, 1920.

round again for another attempt. He forgets, or has not time to wind the tail wheel forward. He finds that the nose goes up very easily, in fact too easily, the airspeed drops and a violent turning tendency develops. Before long he invites complete loss of control.

Effect on Multi-Engined Aeroplanes

The following remarks will be mainly confined to aeroplanes with two axes of thrust parallel to the *fuselage* and approximately on the same level. Aeroplanes with three and four axes of thrust are just touched on.

The principles underlying the affects (*a*) and (*b*) mentioned are the same for all aeroplanes. The engine torque (*c*) does not have much effect, while the gyroscopic effect (*d*) is hardly relevant nowadays to multi-engined aeroplanes. Therefore only (*a*) and (*b*) will be elaborated. The effect of the engines in large aeroplanes is considerably more important, as at present there is no device in common use to assist the pilot in overcoming the large forces which may arise. (*a*) A modern twin-engined aeroplane may have a monoplane or a biplane tail, and from one to four rudders. These may be entirely out of, or parts of them may be in, either slipstream. On most modern aeroplanes the propellers revolve the same way, and so both slipstreams have the same sense of rotation. These apply unsymmetrical forces to the tail, which could be neutralised if the propellers revolved opposite ways.

Suppose that a twin-engined aeroplane has two fins and rudders, and that each fin and rudder is to some extent affected by the slipstream of each engine respectively. If one engine fails and its slipstream disappears, one rudder and fin is at once reduced in effectiveness. Since the rudders are interconnected, the whole rudder control is reduced just when it is most wanted. An experiment has been proposed in which the fins should be offset in such a way that, if one engine fails, the slipstream of the other acting on the offset fin should, to some extent, neutralise the turning tendency set up. It is quite obvious that the turning tendency is most violent at low speeds, for example, when the aeroplane is climbing, or taking off the ground; and on most twin-engined aeroplanes it is not possible to fly straight on one engine until a certain airspeed has been attained. This airspeed is usually considerably above the normal climbing speed.

(*b*) In a multi-engined aeroplane, the effect of the slipstream is important enough, but what is more important still to the pilot is the position of the axes of thrust. If there are two they must at least be just over a propeller's diameter apart, and probably more if they are to be kept fairly low and the *fuselage* has to come between. It must be remembered that the aeroplane has to be controlled getting off the ground; and the lower the axes of thrust, the less liable is the aeroplane to tip on its nose before it has gathered sufficient speed for the elevators to be effective. Apart from this, the fact of having these two axes of thrust disposed as they are introduces unsymmetrical forces of the most violent description, if one engine fails. The violence in various aeroplanes varies, due to engine power relative to size of the aeroplane, distance of engines apart, and the characteristics of the tail. In any case, momentarily, it is a troublesome thing for the pilot to have one engine fail when near the ground. Naturally in any good design it is essential to keep the axes of thrust as close as possible to reduce the pilot's difficulty. It will be on the rudders that the pilot will rely to help him if one engine fails. If, added to this, he has one or two more axes of thrust disposed above the others, fresh complications arise, and render the problem of control still more complex. His elevators will now be involved, and besides the presence or absence of slipstream on the tail, the position of the top axes may introduce large forces. I do not think that unless a really reliable power plant can be designed it is fair to ask a pilot to cope with such a complexity of control, especially as it occurs on aeroplanes the size of which bring him, by reason of his lack of strength, towards the margin of his controlling powers.

Three thrust axes parallel and in a horizontal plane have been used with greater success, as the pilot should not find it so hard, owing to the increased size of the aeroplane in proportion to the power of each engine, to use his starboard and centre power unit, or his port and centre unit, or both outside units, thus always being able to fly without one unit.

In getting to know an aeroplane with variously disposed thrust axes, the pilot should thoroughly familiarise himself with the various effects of the engines on the aeroplane and his power of controlling it under all circumstances, not wait for an engine to fail suddenly when he may be near to the margin of his control. Thus, when near to the ground, he will see to it that he keeps as well as he can within the margin of control which happens to be small in any direction, to allow the maximum to meet an emergency. On the other hand, he will probably find that a judicious use of the engines may be made to assist his control, as in removing drift when landing and in other ways.

Details of Engine Controls on Multi-Engined Aeroplanes

A consideration of the effect of the engines on the aeroplane naturally leads up to a discussion of how the pilot controls the engines, and what means he has of knowing how his engines are behaving apart from the feel of the aeroplane and the sound of the engines. What he is immediately concerned with are his throttles, his revolution indicators and the control of his petrol system.

In a twin-engined aeroplane the pilot has much to occupy his attention. One of his hands is occupied with the wheel or control stick in conjunction with his feet on the rudder bar. He must use his throttles at a moment's notice, so that they must be very accessible and easy to operate. There are two kinds in common use, one consisting of two simple levers side by side, the other of one lever which opens both engines at once, or can be rotated to open one and close the other. There is a difference of opinion among pilots as to which of these is preferable. The first kind has the advantage of showing approximately how much open is each throttle, the second of allowing the engine to be varied with greater ease. However, in the latter case the pilot cannot tell with great precision what is happening to either engine except by the feel of the aeroplane or by looking at his revolution indicators.

It is surprising how well a pilot can learn to manage the twin-lever type of throttle, if the levers are the right distance apart, neither too close nor too far, but just so that he can, with a rotary movement of the palm of his hand, push one lever back and the other forward. Even on German aeroplanes, where the throttles were provided with ratchets, this was to some extent possible.

Where there are four engines to look after, the differential type of throttle lever is almost imperative and the engines have to be run in pairs as on the Handley Page V/1500. The essential thing to guard against is too much rotation of the lever to open one engine and close the other completely. This should in no case exceed 90 degrees.

The system of wires and rods and the brackets which support them should be designed with the minimum of whip so that the pilot knows exactly what he is doing when he moves the throttle lever. In complicated systems such as are bound to arise on twin-engined aeroplanes, whip is liable to occur unless the system is well designed and fitted. If the pilot has throttled down and is landing and the airspeed is very low, one engine opening slightly on its own owing to whip in the throttle control will cause him to swing violently.

Two experiments are to be carried out on a D.H. 10, one in which a synchronising gear is to be fitted to the throttle levers, the gear to be driven off each engine by means of flexible drives. The effect of this should be, in case one engine drops revolutions, automatically to throttle the other to the same revolutions. It should be possible to throw the whole gear out of action by means of releases on the throttle levers. The other experiment is to take advantage of the fact that in case of the failure of one engine the pilot would naturally push very hard on the rudder bar to keep the aeroplane straight. In doing so he would throw into action a gear fitted to the rudder bar to throttle down the engine which was still running.

Hitherto the revolution indicators, owing presumably to the unreliability of long flexible drives, have been in nearly all cases fitted into the side of the engine unit. The pilot cannot see them both at the same time, and has to look round first to one side and then to the other in order to do so. When taking off this is extremely awkward, and until a satisfactory transmission is obtained by which they can easily be fitted on to the dashboard, this serious difficulty will remain. For the pilot's convenience on a twin-engined aeroplane a single dial with two needles superposed, but revolving in opposite directions, would be the neatest arrangement. He would be able to synchronise his engines with great precision and ease. In a four-engined aeroplane two dials with two superposed needles each could be employed.

A frequent cause of engine failure on multi-engined aeroplanes has been a failure of the petrol system. If the petrol system is complicated, as is often the case, no pilot should take the aeroplane into the air without spending sufficient time on the ground to familiarise himself with its operation in every detail. In some cases the petrol system has failed owing to a mechanical defect; in other and probably more frequent cases it has failed owing to incorrect handling by the pilot. Even if the pilot has spent some time in studying it, there may be extenuating circumstances attending a failure to handle it correctly in the air, owing to the pilot's mind being so occupied.

It was largely owing to war requirements, that is of rendering the petrol system still workable when parts of it might be out of action due to gunfire, that petrol systems became complicated. Peace requirements demand a return to the simplest kind of system, and one that imposes the least possible strain on the pilot.

The above remarks simply emphasise the necessity for making the pilot as comfortable as possible, for giving him a simple, accessible and easily understood mechanism for controlling the engines and petrol system so that he may have attention left for appreciating correctly the effect of the engines on the aeroplane and using his aeroplane controls in the best way.

Practical Flying Notes on Twin-Engined Aeroplanes

These notes are based on flying experience with the Handley Page o/400 fitted with twin Rolls Eagle VIII. engines; an experimental one fitted with four 200 h.p. Hispano engines mounted in tandem pairs; the Vickers Vimy with twin Fiat and twin Rolls engines; the German A.E.G. Bomber, and the D.H. 10 with twin Liberty engines.

The Handley Page o/400 was introduced and flown for a considerable time on service without any serious troubles being reported due to turning tendency caused by engine failure on twins. This was mainly due to the fact that relative to the power of its engines the aeroplane was of large dimensions. If one engine dropped revolutions the turning tendency was not violent, the whole aeroplane being comparatively sluggish due to its large moment of inertia.

Nowadays Handley Page aeroplanes have the propellers both of the same hand; some earlier examples had propellers of opposite hand, and the difference between the two arrangements was felt by pilots. There is a turning tendency due to slipstream, which though not very marked, can be detected when both propellers revolve the same way. Where the propellers revolved opposite ways the turning tendency entirely disappeared.

It was when aeroplanes of smaller dimensions for the same power were flown that the first serious trouble arose due to the failure of one engine. The Vickers Vimy and the D.H. 10 both swung violently round if one engine failed, the latter more quickly than the former owing to its small size. If the pilot is taking off the ground and has not had time to gain sufficient airspeed to fly straight on one engine, the obvious thing to do if one engine fails is to throttle the other right down, and if he cannot, by putting the nose down, attain this speed before being compelled to land, he must land wherever he is. There is no other alternative. Not only is this the case, but he must be very alert in throttling down the engine that is still running, or otherwise he will find that the aeroplane is swinging round flat, and thus his longitudinal control has lost much of its power; in fact, on an aeroplane like a D.H. 10 the safest thing is undoubtedly to switch the engine off. This course immediately deprives the pilot of the assistance of any engine power, and if he can afford to control the aeroplane with the engine throttled down and not switched off, his glide is flattened and he has more chance of landing on a good piece of ground.

Before attempting to taxi out on a twin that has not been tested the pilot should take all preparatory measures that are possible on the ground to ensure that his petrol system will be satisfactory in the air. If the petrol is pumped up to a gravity tank which feeds the engines, he should make sure that the delivery from the gravity tank is considerably in excess of the amount required by both engines by taking the petrol flow at both carburettors simultaneously, both with the tail skid on the ground and the aeroplane in flying position. If he is sure of an adequate flow from his gravity tank, then he is sure of enough petrol to tide him over the first few hundred feet of his climb, which is the difficult period from the aeroplane point of view. He should run up each engine separately so that he may listen to it without being confused by the noise of both running at once. He should make sure that his throttles work easily and do not slip backwards or forwards when the hand is removed from them.

It is always wise to taxi for a certain distance before taking off (even though it is possible to take off from the position of running up) so as to give the petrol pumps (if the petrol system includes them) a chance to work a little. It is then possible while taxying to give one or two bursts with each engine to see how it opens out, allowing the aeroplane to swing round either way.

Unless the pilot is not only accustomed to the type, but is also familiar with the particular aeroplane, it is unwise to attempt a fancy take-off, such as a cross wind with one wing down, or by opening the throttles violently and pulling the aeroplane off the ground at a low airspeed. This may be done on a single-engined aeroplane without involving much risk if the engine fails. The pilot should open the throttles gently and take a good run over the ground if it is smooth enough to permit of this, and even when he has left the ground should hold the nose down near the ground until he has attained an airspeed of 60 m.p.h. If one engine fails and he is 15 ft. off the ground doing 45 to 50 m.p.h., he has no chance whatsoever of controlling the swing of the aeroplane. He has only to try this at a safe height by switching off one engine at various airspeeds from 50 m.p.h. upwards and he will soon find out his power of controlling a swing. A D.H. 10 will swing through 90 degs. in about 3 secs. if one engine is switched off at 50 m.p.h. The safest way to take off is with one hand on the throttles so that if one engine fails the throttles may both be pulled back. If the pilot puts the nose of the aeroplane down it will then commence to glide, and if he has sufficient height to attain the airspeed at which he can fly reasonably straight on one engine, assisted by a judicious use of bank, he can then again open out his sound engine and use it to carry him on and effect a landing on good ground. If he is very near the ground and an engine fails, even before he can throttle down the other engine the aeroplane will have swung through a certain angle and thereby considerable drift will have been set up, which if there be no room to sideslip, it will be impossible to eliminate before touching the ground. Thus he is almost certain to damage his undercarriage, though probably nothing of a more serious nature will occur.

When taking off in bumpy weather the aeroplane is slewed about in the bumps, and the sound of the engines is always less regular than in calm weather. This adds to the pilot's difficulties in detecting a faulty engine as he can only tell it by the feel of the aeroplane, the sound of the engines or by the revolution indicators. His first method of knowing is impaired by the bumps, as a bad bump sometimes feels similar to a swing under the influence of engine, his second method by the irregularity of the sound of the engines in gusty weather and by the fact that both engines are running together and the sound of the good one obscures the sound of the bad one, his third method by the fact that it is very awkward to look round at the revolution indicators, especially when he cannot tell by other means which is the defective engine. As laid out in detail, these difficulties appear of the gravest nature. In practice an intelligent pilot has always his flying instinct to help him, which is a very difficult thing to define, but it is clear that the greatest caution should be exercised due to the special characteristics of this type of aeroplane.

Air Work in Mesopotamia

THE *communiqué* issued by the War Office on October 22 stated :—

"Aeroplanes bombed a hostile band which had gathered in neighbourhood of Samawa.

"Aeroplanes have carried out effective attacks on hostile concentrations near Abu Sukhair and Uwal Barur."

The *communiqué* issued on October 23 stated :—

"Our aeroplanes have been active, bombing hostile gatherings in the vicinity of Ur and Nasirieh. Strong hostile concentrations in the former area are reported."

A French Variable Wing

THE recent speed range competitions in France have inspired M. Levavasseur and M. Robert Gastambide, the pioneers who produced the Antoinette monoplane, to tackle the problem of variable wings. They have produced a biplane fitted with a wing, the area of which can be increased from 30 to 50 sq. m. This is accomplished by two sliding portions, one moving forward and the other rearward, the latter varying the camber of the plane. During trials carried out at Etampes with Grandjean as pilot, the machine showed a top speed of 200 k.p.h., but this was reduced to 60 k.p.h. for landing. Trials are shortly to be made for the prizes offered by the *Union pour la sécurité en avion*.

The Joy-Stick Litigation

THE French Court of Cassation on October 20 rejected the appeal of Farman Brothers against the writ of attachment on moneys owing by the French Government obtained by M. Esnault Pelterie, in respect of royalties on his control lever patent. This appeal was regarded as a test case, and the result will affect a number of other firms, against whom M. Pelterie has obtained writs.

New Speed Record

FLYING the 13-sq. m. Nieuport (300-h.p. Hispano), piloted by Kirsch in the Gordon Bennett race, Sadi-Lecointe has achieved his ambition of being first to officially attain a speed of over 300 k.p.h. He covered the kilometre in one direction in $12\frac{1}{10}$ secs., and coming back did the distance in the reverse direction in $11\frac{7}{10}$ secs., making his average time $11\frac{9}{10}$ secs., the speed working out to 302·525 k.p.h., or 189 m.p.h.

FLIGHT

AIRISMS FROM THE FOUR WINDS.

BERLIN to London—670 miles—by a Handley Page aeroplane in six hours 10 minutes, with one stop only, at Cologne, is a worthy achievement for a commercial plane. It must make the exiled Kaiser green with envy, as it is not very much longer than he expected to do the job in August 1914.

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THERE appears to be trouble with the Allies over the Vienna-Munich air service recently inaugurated. From information to hand from Vienna the Allies Commission in that city has sequestrated the Rumpler machines which were allocated for this air route, having regard to it being necessary under the Peace terms for authority to be obtained from the Entente Commission before any Aerial Services can be established in Austria. The Rumpler people claim that the Service is purely a postal one, and has no connection directly or indirectly with military concerns. Therefore the Commission has exceeded its rights. Protest accordingly from the Austrian Minister has been addressed to the Entente.

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HOWEVER much home folk may fight shy of air-travel, it seems to hold the imagination of those in high places of lesser-known countries. An outstanding instance is that of Prince Habib Lotfalleh, the Envoy of the King of the Hedjaz, who arrived in London by air on Friday, last week, from Paris. He came for the purpose of transmitting to the Prime Minister telegrams received from King Hussein explaining certain misunderstandings prevalent about the situation. After disposing of these telegrams Prince Lotfalleh arranged to return by air to Paris on Saturday, subsequently flying back to London to present his credentials to King George.

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IT'S an ill wind, etc. Owing to the coal strike and subsequent curtailment of the train and cross-Channel services, the London–Paris air-way, has had quite an influx of business bookings. Was it this that gave the railway companies to think so furiously that on Tuesday announcement was made of the resumption of some of the services which had been originally struck out? We wonder.

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COLONEL HANKIN, of the Indian Medical Services, the results of whose studies of Soaring Flight will be remembered by early readers of FLIGHT, gave some further highly interesting data last week upon the same subject at a meeting of the Zoological Society. Colonel Hankin described observations he had made on the flight of flying fishes and the soaring flight of vultures. He said that the two kinds of flight were much alike in their mechanical nature and in the rates of speed attained under different conditions of temperature and weather. He thought that the secret of soaring flight might be penetrated by observations of flying fish. Experiments made in France suggested that eddies formed under the wings were the cause of propulsion, but he admitted that the explanation was still unsatisfactory. He had noticed that the tips of the wings in both the fish and the birds were flexed separately from the general wing surface, and that the wings in both cases were used in the same way for the sudden arrest of rapid flight.

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FOLLOWING up the subject of Colonel Hankin's remarks, Mr. Handley Page pointed out that there was a close parallel between the development of the bird and the development of the aeroplane. In a primitive bird like the fossil archæopteryx the expanse of wing was relatively small and the tail enormous, the function of the tail being to secure stability. In early aeroplanes, also, the tail was relatively very large. The single curvature of the wings was such that in the absence of a large tail any tendency of the nose to rise or fall out of the horizontal position increased, unless it were corrected by the tail. In the more modern double-curved aeroplane wings, and especially in those with flexible tips, the tendency was toward the automatic correction of deviations from stability, and the tail became less important. Nature had improved bird models in the same way. But, as an aeronautical engineer, he confessed that he was not much impressed by the sections of birds' wings, and those which, like vultures, engaged in soaring flight had much less perfect wings than smaller birds. He believed that soaring flight was due to upward currents of warmer air, and that the birds had to flap, or to gain forward motion by descending, when they passed from one upward current area to another.

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AND then there is the new H.P. wing construction which, according to certain of the lay press, has already made "hovering" an ordinary feature of the air-scape.

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FOR really the latest one must go to—Hull. From the *Daily Mail* of that city we learn there are forthwith to be flying detectives. Thus the London correspondent of our contemporary :—

"I am informed by Scotland Yard that a small number of the leading detectives are to be initiated into the mysteries of flying, and that one or two aeroplanes are to be placed at their disposal to assist in the capture of fugitives from justice. In addition, effective arrangements have now been completed for attaching a detective to each aerodrome in the country, so that "wanted" persons who seek to escape from the country by means of the flying machine will find it very difficult. Only a day or two ago a man wanted for extensive frauds was stopped at Croydon aerodrome just as he was on the point of embarking for Paris, having chartered a special machine to do the journey "regardless of cost."

Plaque by Charles Pillet, presented at the Geneva Conference to the Aero Club of Belgium by the other clubs of the F.A.I. This presentation was the result of a decision when the F.A.I. met in Brussels last year, to commemorate the part taken by Belgium in the late War

THE ROYAL AIR FORCE

London Gazettte, October 8

Technical Branch

Flying Officer A. J. Briddon to be Flying Officer, Grade (A), from Grade (B) Aug. 9, 1919, and is graded for purposes of pay and allowances as Flight Lieut. while employed as Flight Lieut., Grade (A); Aug. 9, to Dec. 31, 1919.

Flying Officer T. C. Penna relinquishes the grading for pay and alowances of Flght Lieut. on ceasing to be empoyed as Flight Lieut.; Oct. 31, 1919.

Transferred to Unemployed List.—Lieut. R. Harrison; Aug 1, 1919. Sec. Lieut. T. H. Rudd; Oct. 8, 1919. Lieut. W. T. O. Cosgrove; May 29 (substituted for *Gazette*, June 18).

Maj. H. E. Wimperis relinquishes his R.A.F. commn., and is permitted to retain his rank.

The notification in *Gazette* of July 6 concerning Flying Officer A. J. Briddon s cancelled.

Medical

R. J. Aherne (late temp. Capt. R.A.M.C.) is granted a temp. commn. as Capt.; Nov. 7, 1918 (substituted for *Gazette* Dec. 13, 1918).

Memoranda

Lieut.-Col. R. Williams, D.S.O., O.B.E., relinquishes his R.A.F. commn. on ceasing to be employed; Oct. 30, 1919.

Maj. (acting Lieut.-Col.) H. A. Moore, C.B.E., M.C., relinquishes his R.A.F. commn., and is permitted to retain rank of Lieut.-Col.; July 1, 1919.

London Gazette, October 12

Short Service Commissions

Chaplains' Branch.—Rev. M. J. Eland is granted a short service commn., with the relative rank of Squadron Leader; Oct. 8.

Flying Branch

Pilot Officer G. E. Hughes to be Flying Officer; Jan. 25 (since demobilised).

Lieut. E. B. Hakeman relinquishes his R.A.F. commn. on ceasing to be employed; April 20, 1918. Lieut. L. S. Duffill and Lieut. M. MacEwan, D.F.C., relinquish their R.A.F. commns. on appt. to the T.F., and are permitted to retain their rank.

Transferred to the Unemployed List.—Sec. Lieut. D. Withycomb; Jan. 18, 1919. Lieut. J. Douglas; Jan. 26, 1919. Sec. Lieut. J. W. Brown, Sec. Lieut. (Hon. Lieut.) W. G. Davis; April 15, 1919. Sec. Lieut. J. S. Tinn; Sept. 12, 1919. Lieut. M. MacEwan, D.F.C.; Sept. 21, 1919 (substituted for *Gazette*, Oct. 28, 1919). Lieut. A. R. Jackson; Oct. 1. The surname of E. A. Hardiman is as now described, and not Hardman as in *Gazette*, Sept. 6, 1918.

Administrative Branch

Flying Officer J. M. J. C. J. I. Rock is restored to the active list Oct. 11).

Transferred to the Unemployed List.—Sec. Lieut. J. R. McDonald; Sept. 25, 1919. Sec. Lieut. G. E. Nicol; Oct. 15, 1919.

Technical Branch

Lieut. E. S. Steddy to be actg. Capt. while employed as Capt., Grade (A) from April 15, 1918, to Sept. 18, 1918 (substituted for *Gazette*, Feb. 11, 1919). Pilot Officer A. A. Greenwood to be Flying Officer, Grade (A); Oct. 22, 1919 (since relinquished commn.). Sec. Lieut. C. J. Poole to be Lieut., Grade (B), without pay and allowances of that rank; April 2, 1918. Pilot Officer (Hon. Flight Lieut.) H. J. Barnham to be Flying Officer, Grade (A), without pay and allowances of that rank; Oct. 25, 1919. G. M. Cox is granted a temp. commn. as Flying Officer; June 24.

Transferred to the Unemployed List.—Lieut. I. Massey; July 14, 1919. Lieut. A. G. C. Dann; Dec. 11, 1919 (substituted for *Gazette*, Feb. 17). Sec. Lieut. H. C. Duckworth; June 24. Lieut. S. Hampton; Oct. 1. The surname of Capt. A. F. Allen is as now described, and not Allan as stated in the *Gazette* of June 25, 1918, page 7,489.

Medical Branch

The following Sergt.-Majs., Class 1, are granted permt. commns. as Qtrmstrs. (Medical) with hon. rank of Flying Officer.—187485 C. B. Willsher; Aug. 1, 1919. 302630 W. Gamblen; July 1. 301542 F. W. Goodread; Sept. 1. Capt. E. T. McElligott is transfd. to the Unemployed List; April 9.

Chaplains' Branch

Rev. A. A. Crawshaw, M.A., relinquishes his commn. and is permitted to retain the title of Hon. Chaplain to the R.A.F.; Oct. 12.

Memoranda

The following Cadets are granted hon. commns. as Sec. Lieuts., with effect from the date of their demobilisation.—177520 C. C. J. Baker, 316674 M. L. F. Shannon, 156626 A. W. Browning. Cadet 786 H. J. S. Leslie is granted an hon. commn. as Sec. Lieut., with effect from the date of his demobilisation.

Overseas Cadet 1257924 G. S. Ormon is granted an hon. commn. as Sec. Lieut., with effect from the date of his demobilisation.

The following Proby. Flt. Officers are granted hon. commns. as Sec. Lieuts.—L. A. Willmore; March 15, 1919. T. R. W. Bulkeley; Nov. 1, 1919.

P.F.O. M. J. Macdonell is granted a temp. commn. as Sec. Lieut., with effect from Feb. 15, 1919.

Sec. Lieut. M. J. Macdonell relinquishes his commn., with permission to retain his rank; July 11, 1919.

The notification in the *Gazette* of Sept. 28 concerning Cadet 175163 A. Adams is cancelled.

The Christian name of Cadet 352530 Stanley Adams is as now described, and not Samuel as in *Gazette*, July 15, 1919.

London Gazette, October 15

Short Service Commissions

Flight Lieut. D. L. Ingpen is granted a short service commn. in rank stated; Oct. 11.

Flying Branch

Lieut. R. de la Bere relinquishes his R.A.F. commn. on appt. to T.F., and is permitted to retain his rank. Lieut. J. Mitchell, M.C. (Lieut., R.A.), relinquishes his R.A.F. commn. on return to Army duty; June 6, 1919.

Transferred to Unemployed List.—Lieut. R. L. Hall; Jan. 21, 1919. Sec. Lieut. H. T. Yearley; Jan. 28, 1919. Lieut. T. Farrar; May 30, 1919. Sec. Lieut. W. B. Clarke; May 31, 1919. Lieut. L. Grime; June 3, 1919. Sec. Lieut. H. S. Cranfield; Sept. 24, 1919. Sec. Lieut. A. Dewsbury Oct. 18, 1919.

Administrative Branch

Transferred to Unemployed List.—Lieut.-Col. C. F. Campbell, C.I.E., O.B.E.; Sept. 11, 1919. Sec. Lieut. (Hon. Lieut.) T. J. Harrington; Sept. 14, 1919. Lieut. J. Mitchell, M.C.; Sept. 27, 1919.

Sec. Lieut. H. J. Coles is removed from Unemployed List and commn. terminated. Permission to retain rank cancelled.

Technical Branch

Maj. J. H. Hills to be Maj., Grade (A.), from (S.O.); May 21, 1918 (substituted for notification in *Gazette*, May 31, 1918).

Transferred to Unemployed List.—Maj. J. S. Buchanan; Aug. 1, 1919. Sec. Lieut. W. T. Gilmour; Aug. 20, 1919. Sec. Lieut. (Hon. Lieut.) J. F. Alexander; Oct. 15, 1919.

Sec. Lieut. (Hon. Lieut.) F. McGuffie relinquishes his commn. on account of ill-health contracted on active service, and is granted rank of Capt.; Feb. 29 (substituted for *Gazette*, March 2).

Memoranda

Hon. Sec. Lieut. C. O. Anson relinquishes his hon. R.A.F. commn. on appt. to a S.S.C.; Sept. 7.

The Christian names of Hon. Lieut. Frederick Gordon Crosby are as now described, and not as stated in *Gazette*, Sept. 17.

London Gazette, October 19

Flying Branch

Sec. Lieut. D. C. McDonald to be Lieut.; Feb. 12, 1919 (since demobilised). (Substituted for notification in *Gazette*, Sept. 21.)

Transferred to Unemployed List.—Sec. Lieut. C. M. Keyworth; April 20, 1919. Sec. Lieut. C. C. Aley; Sept. 4, 1919. Sec. Lieut. L. Millar; Sept. 16, 1919. Sec. Lieut. E. C. Gordon; Sept. 18, 1919. Sec. Lieut. F. G. Craig; Sept. 24, 1919. Lieut. (hon. Capt.) (actg. Capt.) J. F. Davison, M.C.; Oct. 5.

Lieut. P. D. P. Hamilton relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Dec. 23, 1919. (Substituted for notification in *Gazette*, Dec. 23, 1919.)

The surname of Sec. Lieut. H. A. Gilbert is as now described, and not Gilber as stated in *Gazette*, Aug. 23, 1918, p. 9830.

The notification in *Gazette*, Aug. 20, 1918, concerning Sec. Lieut. J. Nicolson, is cancelled.

Administrative Branch

E. P. Ryan (Lieut. and Qrmr., Lanc. Fus.) is granted a temp. commn. as Lieut.; Aug. 16, 1918. (Substituted for notification in *Gazette*, March 4, 1919, and July 20, Tech. Branch.)

Transferred to Unemployed List.—Sec. Lieut. A. J. Miller; March 18, 1919. Lieut. P. Reed; Oct. 6. Sec. Lieut. G. B. Demaine; Oct. 7. Lieut. W. D. McKinnon; Oct. 19.

Lieut. P. Harvey relinquishes his R.A.F. commn., and is permitted to retain his rank; Jan. 31.

Technical Branch

Sec. Lieut. (Hon. Lieut.) R. Hodge to be Lieut.; April 2, 1918.

Pilot Officer I. F. A. Klipper to be Flying Officer without pay and allowances of that rank; April 25. Capt. E. W. Keesey relinquishes his R.A.F. commn. on appointment to the T.F., and is permitted to retain his rank.

Sec. Lieut. J. H. Stone is transfd. to Unemployed List; Feb. 3, 1919.

Memoranda

The following Cadets are granted hon. commns. as Sec. Lieuts., with effect from the date of their demobilisation.—178247 A. Evans, 860028 B. C. Godson, 406371 J. S. Manning, 203346 L. Stoakes, 181724 J. Stewart, 51952 C. L Wicks.

Capt. B. H. Sisson is transfd. to Unemployed List; Oct. 1.

P.F.O. J. Marsh is granted an hon. commn. as Sec. Lieut.; Feb. 12, 1919

Earlier Air Mails

SINCE Monday last the Air Mail to Paris has been dispatched from Croydon at 1 p.m. instead of 3.30 p.m., while the mail for Brussels and Amsterdam leaves Cricklewood at 1.30 p.m. instead of 2.30 p.m. Mails for Paris have now to be handed in at the G.P.O. before 11.30 a.m., and those for Holland and Belgium before 12.30 p.m.

At the chief district offices the times of handing in are now :—

	Paris.	Brussels.
General Post Office ..	11.30 a.m.	12.30 p.m.
Threadneedle Street B.O. ..	11.15 ,,	12.15 ,,
Lombard Street B.O. ..	11.15 ,,	12.15 ,,
Parliament Street B.O. ..	11.0 ,,	12.0 noon.
Charing Cross B.O.	11.20 ,,	12.20 p.m.
Western Central D.O. ..	11.40 ,,	12.40 ,,
Western D.O.	11.15 ,,	12.15 ,,
South-Western D.O. ..	11.15 ,,	12.15 ,,
South-Eastern D.O. ..	9.0 ,,	9.0 a.m.

(Regstered letters must be handed in five minutes earlier.)

A Trans-Canadian Flight

THE arrival here on October 17, at the end of his Transcontinental flight, of Air Commodore Tylee, flying a D.H.9 A machine, marks an epoch in Canadian history, wires the *Times* correspondent at Vancouver. Though his actual flying time was 48 hours 10 mins., his journey commenced at Halifax on the morning of October 7.

Gordon-Bennett Balloon Race

SEVEN balloons left Birmingham, Alabama, on October 23 in this event., and it is believed that the winner is the "Belgica," which landed on an island in Lake Champlain.

To Our Readers

As we continually receive complaints from readers that they experience difficulty in obtaining their copy of FLIGHT promptly each week, we draw their attention to the subscription form which is printed on page xvi of the current issue. If this is sent, accompanied by the appropriate remittance, to the publishing offices, 36, Great Queen Street, W.C., it will ensure FLIGHT being received regularly each week upon the day of publication.

FLIGHT

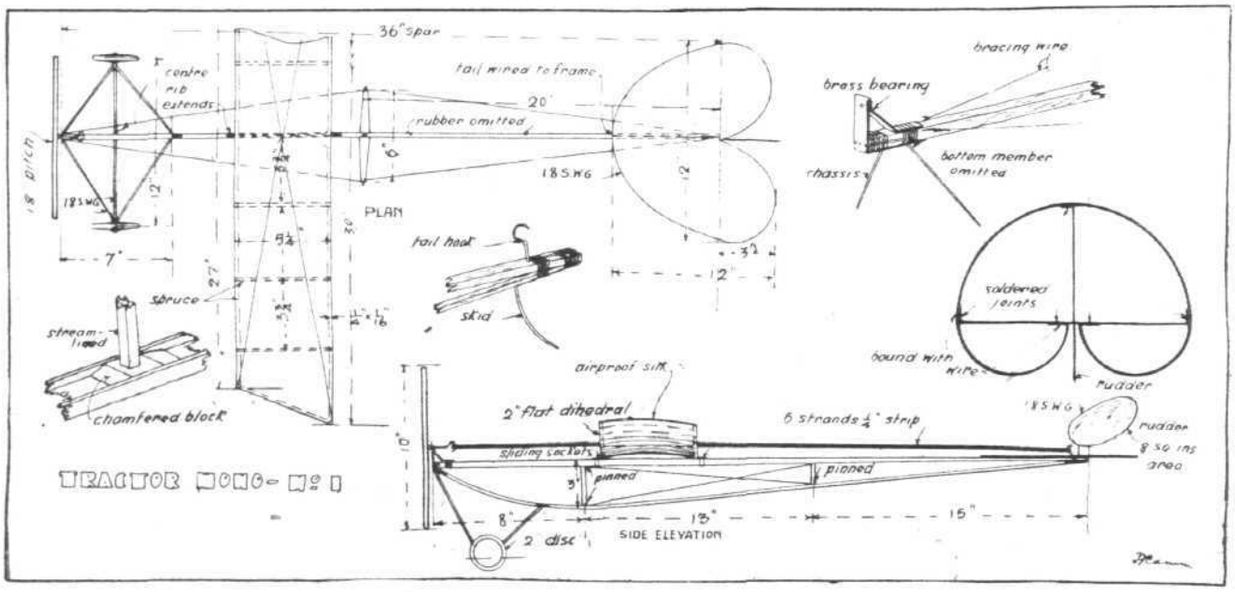
MODEL AEROPLANES

NOTE.—*All communications should be addressed to the Model Editor. A stamp should be enclosed for a postal reply*

CONTINUING the series of machines (more difficult ones later) the accompanying drawings show a type of tractor monoplane sinple in design yet yielding satisfactory results. According to my records I obtained a duration of 58 seconds in 1912 with the machine represented by the drawings, and I have no doubt that with present experience more than this could easily be obtained. The side elevation indicates that the spar tapers in a fore and aft direction to impart strength at its otherwise weakest point. This is known as cantilever construction. The bottom member, which acts as a tie whilst also improving the general appearance, is bent to the form shown by means of steam. The bracketed brass bearing engages with the two members ; but if the bottom member is dispensed with the bearing sockets on, as shown in detail. It is bound on with florist's tinned iron wire and lightly soldered with an iron sufficiently hot to cause the solder to run without burning the spar. If a hollow spar is used, as stated in one of the general annotations, extends over the leading and trailing edges to enable the sockets to clip the plane to the spar.

The tail should be drawn full size upon a board, tacks being driven on each side of the outline and the wire spring between these. The cross ribs are next soldered into place with the wire *in situ*, thereafter removing the tacks. Sewing is better than glue to attach the fabric to the tail, as the latter is hygroscopic. Bind the tail to the *fuselage* with fine copper wire. The rudder, by the way, is soldered into place prior to covering the tail.

A block of whitewood is used for the screw, which must be of the proportions indicated. Pass the spindle through the boss, and turn a portion of it back into the wood, using two cupped washers placed face to face and filled with grease to minimise friction on the bearing. Six strands of quarter strip elastic is the maximum the machine should need, five



the channel should be packed for about an inch each end so that the fittings carried by the respective ends do not crush in the walls of the spar.

The steel wire chassis is fixed by similar binding and soldering. The triangulated V side struts are rigidly attached by the lugs bent in them. It will be seen from the perspective sketch that the chassis follows round the end of the spar. The bracketing of the bearing is necessary to withstand the tension of the rubber. Disc wheels are soldered to the axle arms, and pieces of by-pass tubing are slipped over these latter to retain the wheel in place. A wooden kingpost is pinned and bound to the spar in the position shown to brace the spar against the lateral distortion caused by the rubber when in torsion. Small wire hooks are attached to the vertical faces of each end of the top spar to receive the bracing wires passing from the kingpost extremities.

The method of forming and attaching the tailskid and rear rubber-boot are shown in detail. They are both formed on the one piece of wire, and are bound and soldered into position.

The plan view shows the approximate relative position of the components.

The main plane is made from silver spruce, the ribs being cambered $\frac{3}{8}$ in. maximum, with a gradual washout towards the tip. The dihedral angle is "flat," and imparted by steam. Bands of tin secure the planes in position in such a manner that adjustment to the centre of gravity and centre of pressure may be easily effected. The centre rib, being the amount used by the writer. It should be well lubricated. Valve tubing should be pushed over the spindle and tail-hook to lessen the possibility of the wire cutting through the rubber when the latter is fully wound.

Only a few turns should be given to test the model, which should be launched *down* wind for the first flight. The model should not weigh more than four ounces.

K.M.A.A.—Please Note

Now that the Kite and Model Aeroplane Association has been temporarily reformed, will all London and Provincial enthusiasts and club secretaries please communicate with Mr. W. H. Akehurst, 27, Victory Road, Wimbledon, S.W., without delay ? I understand that all of the cups and trophies have been recovered and will be placed for competition as soon as something definite can be arranged. Meanwhile the Association is anxious to strengthen its hands and to recreate the enthusiasm of pre-War days. It is interesting to note that Messrs. Houlberg, Slatter, Louch, Groves, McBirnie, Stanger, etc., are willing to renew their activities, and one anticipates a recrudescence of enthusiasm.

Replies to Correspondents

A. S. G. (Sheffield).—Glad to have the description and photo. ; please forward any other particulars of machines which you have.

L. B. (Hardwick).—The article given on the long-distance monoplane will no doubt have satisfied your requirements. I now intend dealing with a complete series of machines.

SIDE-WINDS

THE performance put up by the Supermarine Amphibian at Martlesham and Felixstowe was in many respects a noteworthy one. At the end of the 24-hour mooring test it got away within the 60 minutes allowed for starting up and getting under way, the Rolls-Royce engine starting on the second turn of the handle. We understand that it was the only amphibian to complete the whole of the tests without any alteration or adjustment having to be made.

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IN these days of soaring prices it is interesting to hear of a process that will effectively repair scored cylinders at a minimum cost. This is today being achieved by the Barimar Metallurgical Process. In pre-War days the only reliable method of rendering scored cylinders thoroughly efficient was to weld up the scores, regrind bores and then fit new pistons complete. Such an operation was a costly one and the work took some four to six weeks to complete. Today, many cylinders scored in this way are being successfully treated by this newest invention, for a figure which is only about 10 to 20 per cent. of the cost of the old method, and the work is finished in about two days. A further point, and one of paramount importance, is that when cylinders are repaired by this process, they do not have to be welded or reground, and they do not require new pistons.

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DR. A. P. THURSTON, D.Sc., F.R.Ae.S., etc., whose name is well known in connection with aviation matters, has now established himself at Bank Chambers, 329, High Holborn, W.C. 1, where he is specialising in the development of inventions and work of such nature.

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IT is interesting to learn that nine of the aeroplanes engaged in commercial services between England and the Continent have already been equipped with the Marconi wireless telephone; and that others are now being similarly fitted.

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ONE of the outstanding features of the Commercial Vehicle Show to those interested in the electrical equipment side of the industry was the universal manner in which the manufactures of the great Acton House predominated. No less than 50 lorries, buses, and commercial cars were C.A.V. equipped, while all other British makes total only 17 amongst them.

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A Rumour Scotched

DAME RUMOUR seized on the fact that the Martinsyde works closed down last week for stocktaking to start a pretty little story indicating that the closing was permanent. Messrs. Martinsyde, however, soon corrected this and made it clear that the temporary closing did not in any way affect their business, as they were carrying on as usual.

Commercial Consistency

ONE of the Airco 16 machines of the Air Transport and Travel Line, G-EAQS, put in a very consistent six-days' work between Croydon-Paris-Croydon last week. From the 17th to the 22nd inst. she made three "out" and four "home" trips without missing a day's flying. Incidentally, she made the fastest time of the week for the journey each way, doing the Paris-Croydon trip in 1 hr. 50 mins., and the Croydon-Paris in 2 hrs.

Berlin-London in 8 hours

ONE of the fast machines of the Handley Page service on October 25 made the first trip between Berlin and London within 8 hours. Leaving Berlin at 9.15 a.m., a stop for lunch was made at Cologne at 12.25 p.m. Restarting at 2.10 p.m., the trip to Cricklewood was made in exactly three hours, the machine landing safely at 5.10 p.m. The actual flying time for the trip was 6 hours 10 minutes.

A Week at Le Bourget

DURING the week from October 10 to October 17, 143 aeroplanes left or landed at the Le Bourget Aerodrome, near Paris, carrying an aggregate of 315 passengers, 33 tons of goods, and 3 cwt. 66 lb. of mails.

Air Fleet for the Reds ?

A REPORT from Reval states that according to the paper *Pravda*, the Bolsheviks are establishing a Red air fleet, and are constructing a large number of aeroplanes of the latest type. Many young men are being trained as aviators.

Cossack General Escapes by Air

BY way of concluding a wireless message from Chita, Trans-Baikalia, Siberia, to the effect that "partisans" have occupied the city and that a temporary Assembly has taken over full power, it is stated that General Semenoff, the Cossack leader, who recently acknowledged the supremacy of Wrangel, escaped in an aeroplane.

PUBLICATIONS RECEIVED

Technical Memorandum No. 20. Extracts from German, Technical Reports. Controller of Information, Air Ministry, London, W.C.

Technical Note No. 16. Experience with Geared Propeller Drives for Aviation Engines. By K. Kutzbach. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 20. Notes on Specifications for French Airplane Competitions. By W. Margoulis. The National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 21. Drag or Negative Traction of Geared-Down Supporting Propellers in the Downward Vertical Glide of a Helicopter. By A. Toussaint. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Debentures: The Purposes They Serve and How They are Issued. By Herbert W. Jordan. London: Jordan and Sons, Ltd., 116-117 Chancery Lane, W.C. 2. Price 1s. 6d. net.; by post 1s. 10d.

American Chamber of Commerce in London, Year Book, 1920. American Chamber of Commerce in London, 8, Waterloo Place, Pall Mall, S.W. 1.

Design of Aeroplane Engines. By John Wallace. London: Benn Brothers, Ltd. Price 15s.; by post 15s. 9d.

Aeroplane Structural Design. By T. H. Jones, B.Sc., and J. D. Frier, A.R.C.Sc. London: Sir Isaac Pitman & Sons, Ltd. Price 21s. net.

Aeronautics in Theory and Experiment. By W. L. Cowley and H. Levy. London: Edward Arnold. Price 25s. net.

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AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1919

Published October 28, 1920

13,124. N. A. T. N. FEARY. Constructional material for seaplanes. (151,672.)
15,473. IRVING AIRCHUTE CO. Safety parachute pack device. (138,059.)
16,204. A. J. YEO. Rotary engine. (151,718.)
17,658. D. J. MOONEY and F. B. UNDERWOOD. Metal strut and stay-wire connections. (151,762.)
18,440. J. B. H. GUEST. Stabilising and control gear. (151,769.)
20,996. S. L. MORRIS. Kite. (151,805.)
26,019. H. TOMLINSON. Flying controls for aeroplanes, seaplanes, etc. (151,833.)
28,914. J. G. DAVIDSON and J. W. ARCHER. Rotary engines. (151,856.)

APPLIED FOR IN 1920

Published October 28, 1920

18,225. AUSTIN MOTORS CO. and C. B. WALKER. Screw propellers. (151,917.)

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